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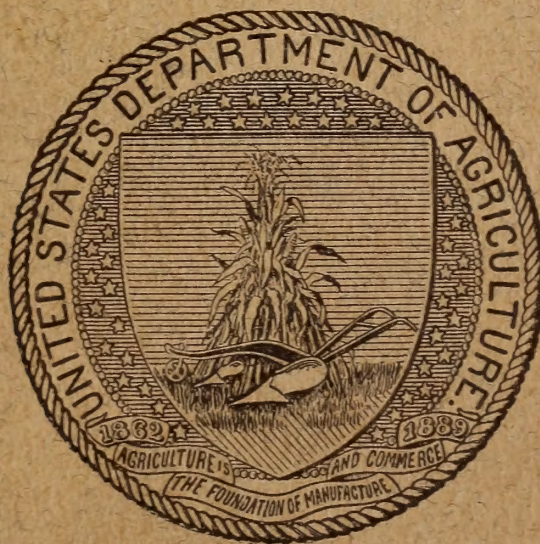


A BIOLOGICAL RECONNAISSANCE OF THE BASE OF THE ALASKA PENINSULA

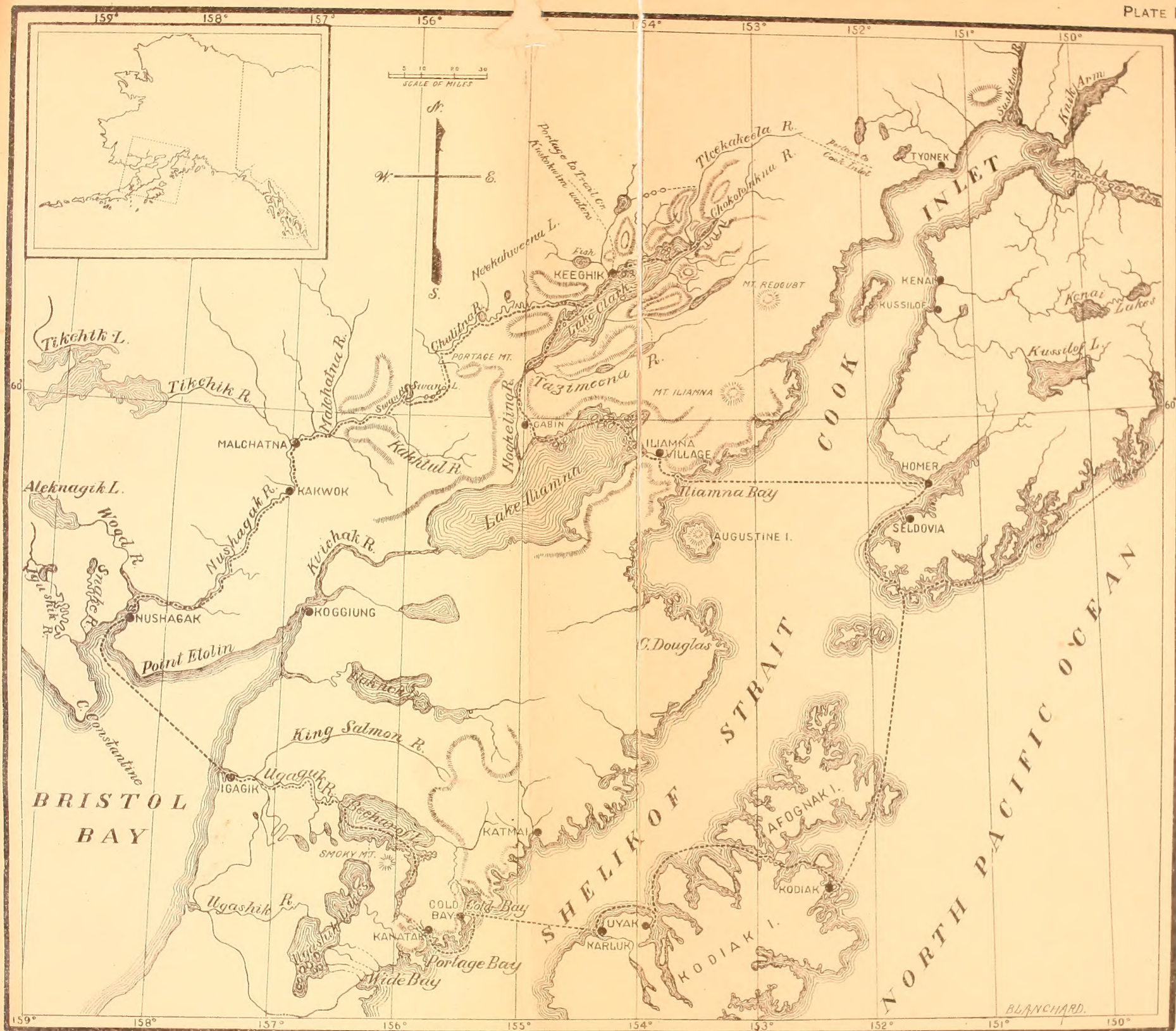
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1904



SKETCH MAP OF THE VICINITY OF THE BASE OF THE ALASKA PENINSULA.

Route of expedition -----

LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,

BIOLOGICAL SURVEY,

Washington, D. C., August 15, 1904.

SIR: I have the honor to transmit herewith for publication, as North American Fauna No. 24, the results of a biological reconnaissance of the base of Alaska Peninsula by Wilfred H. Osgood, an assistant in the Biological Survey who visited this part of Alaska in 1902. It comprises observations made in the field and subsequent systematic studies, and is entirely the work of Mr. Osgood.

The illustrations, consisting of two maps and five half-tone plates, are necessary to a clear understanding of the text.

Respectfully,

C. HART MERRIAM,

Chief Biological Survey.

Hon. JAMES WILSON,

Secretary of Agriculture.

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A BIOLOGICAL RECONNAISSANCE OF THE BASE OF THE
ALASKA PENINSULA.

By WILFRED H. OSGOOD.

INTRODUCTION.

The present report contains an account of a hasty trip made during the latter part of the summer and fall of 1902 to the base of the Alaska Peninsula. Work was done on both coasts and in part of the interior. On account of the importance of the region as a meeting ground of some of the life areas of Alaska, it was desired that more time be spent in the field, but the shortness of the season prevented. Since it is not feasible at present to continue work in this region, it has been decided to record such results as were obtained.

Throughout the trip Alfred G. Maddren acted as my assistant and Walter Fleming was employed as camp hand. During the season of 1903 Mr. Maddren spent considerable time in the Cold Bay and Becharof Lake region. Although for the most part occupied otherwise, he secured a considerable number of specimens, as well as some important notes for which I am indebted to him. M. W. Gorman, of Portland, Oreg., who was engaged in botanical work for the Department, accompanied us during July on Lakes Iliamna and Clark, and his cheerful cooperation was greatly appreciated.

Travel was chiefly by canoe. On account of the inclement weather, which prevailed most of the time, progress was slower than if the party had been able to start before the fall rains began. Natives were employed from time to time as carriers and guides, and as a rule proved faithful and efficient. The employees of the Trans-Alaska Company, which had some stores in the region, rendered considerable assistance, and we were particularly indebted to H. Hicks and C. T. Brooks. Much of the region has seldom been visited by white men, and such of the streams and lakes as were shown on published maps

were indicated on little more basis than hearsay or the unreliable sketches of natives and prospectors. The accompanying map, made from rough sketches and estimates, is doubtless incorrect to a great degree, but will show the points to which it is necessary to make special reference. Until actual surveys are made in the region, it may prove helpful to future travelers.

GENERAL ACCOUNT.

OUTLINE OF ROUTE.

Landing at Iliamna Bay (Pl. I, Frontispiece) on July 10, the party immediately proceeded across the mountains to Lake Iliamna and thence to Lake Clark, where a few days were spent. On August 10 the journey up the Chulitna River was begun. Some short delays were caused by the uncertainty of the native guides as to the correct route, but on the 18th of the month the head of the small south fork of the river was reached. Crossing from there to Swan Lake and starting down stream August 27, the Swan, Kakhtul, and Nushagak rivers were successively descended and Nushagak reached September 12. After considerable delay a small sailboat was secured to take us across Bristol Bay, and on September 26 we started for Igagik. Thence the Ugaguk River was ascended and Becharof Lake crossed to the head of its southwest arm, which was reached October 7. Continuing from here over the mountains to Kanatak, on Portage Bay, we skirted the coast to Cold Bay, which was reached October 13. A small steamer called on the 26th of the month and we took passage for the United States, very glad to flee from the exceedingly stormy weather which had prevailed during the last two months of the trip.

For convenience of description the route outlined above may be divided into three parts: (1) Iliamna Bay to Lake Clark, including the Lake Iliamna and Lake Clark region; (2) Lake Clark to Nushagak, including the Chulitna River region and the Nushagak drainage from Swan Lake to Nushagak; and (3) Nushagak to Cold Bay, including the peninsula region in the vicinity of the Ugaguk River and Becharof Lake.

ILIAMNA BAY TO LAKE CLARK.

The coast of Iliamna Bay, like nearly all the southeast side of the Alaska Peninsula, is extremely mountainous. The mouth of the bay is wide, but the upper end, for 4 or 5 miles, is quite narrow. Even in summer it is a very windy place. When we landed, on July 10, a howling gale was blowing down the funnel formed by the mountains on each side, and we reached shore with considerable difficulty. The mountains are from 3,000 to 6,000 feet in altitude, and are quite precipitous (Pl. II, fig. 1). They support no trees worthy of the name, but there are several groves of fair-sized balsam poplars (*Populus balsamifera*) in the narrow valley at the head of the bay and also on some low



FIG. 1.—MOUNTAINS NEAR ENTRANCE TO ILIAMNA BAY.
Plant in foreground dwarf birch (*Betula glandulosa rotundifolia*).



FIG. 2.—MOUNTAIN MEADOW ON WEST SIDE OF ILIAMNA PASS.
Shrubby plant, alder (*Alnus viridis*).

ground about a small indentation on the west side called Cottonwood Bay. On the mountain sides a few tiny spruces from one to two feet high proudly raise their heads above the matted mosses, lichens, and small shrubs. A few depauperate sprouts of the paper birch (*Betula papyrifera alaskana*) also occur. The characteristic shrubs are the alder (*Alnus viridis?*) and the dwarf birch (*Betula glandulosa rotundifolia*), which are found in great abundance. The portage trail leads up the narrow valley of a small stream flowing into the head of the bay, and after 3 or 4 miles crosses a low mountain pass possibly less than 1,000 feet high. On the other side it runs down through several mountain meadows (Pl. II, fig. 2), around a small lake, and along a stream draining toward Lake Iliamna. Passing for 3 or 4 miles through a good growth of spruce timber, it terminates at Iliamna River, opposite the native village of Iliamna. From the head of Iliamna Bay to Iliamna village is about 12 miles. Outfits and supplies are easily taken across by pack horses, or natives from Iliamna village may be secured to 'pack' them. The Iliamna River is a stream of fair size flowing from the mountains east of Iliamna Pass, and at the village is about 50 yards wide. Six miles farther on it enters Lake Iliamna. The timber in this vicinity is of the characteristic type found throughout the Hudsonian zone in northern Alaska. The white spruce (*Picea canadensis*) is the dominant tree, and with it are found its usual deciduous neighbors, the balsam poplar and the paper birch. Alders abound on the hillsides and willow thickets border the streams. Mosses, lichens, and small woody plants, chiefly Ericaceæ, cover the ground. A few small ponds near the river are bordered with grasses and sedges, and, where conditions favor, are filled with large yellow pond lilies (*Nymphaea*).

Lake Iliamna is about 60 miles long and from 15 to 25 miles wide. It can not be more than a few feet above the level of the sea, as the Kvichak River, its outlet to Bristol Bay, is navigable for small sloops. At its upper end it is rather shallow and contains many small islands, while the lower end is an uninterrupted expanse of comparatively deep water. The southeast shore is rather mountainous. Several peaks immediately southwest of the mouth of the Iliamna River are at least 3,000 feet high and are probably continuous with the mountain mass which is seen so prominently on the coast near Cape Douglas. Fair-sized mountains are also to be seen to the northward between the mouths of the Iliamna and Nogheling rivers, but some 10 miles east of the latter they dwindle to very small size. Spruce timber is found on the southeast shore all the way down to the Kvichak River, but on the other side it ceases about 10 miles beyond the Nogheling. From this point to the Kvichak there are no coniferous trees. Timberline is quite low, being only 100 to 200 feet above the lake.

In going from Lake Iliamna to Lake Clark a portage of about 6 miles is necessary in order to avoid the Petroff Falls in the lower part

of the Nogheling River. The carry begins a few miles east of the mouth of the Nogheling and crosses the triangular peninsula to the river above the falls. The first half of the trail is over rather swampy open country and the last through open forest on comparatively hard ground. Above the portage there is one stretch of a third of a mile of swift water, easily descended by canoes but difficult of ascent except at low water when 'tracking' is practicable; otherwise the river is ascended without great difficulty although the current is strong. The entire length of the Nogheling is from 25 to 30 miles. In the vicinity of the portage it flows in one general direction between banks from 50 to 75 feet high, but toward its upper end it traverses lower country and its course is more devious. Near Lake Clark it expands in two places, the larger being about a mile wide by 3 miles long. Low mountains, somewhat sparingly covered with small spruce timber, rise on both sides of the river, those on the west being higher and reaching an approximate altitude of 1,500 feet.

Our first view of Lake Clark from the low ground near the head of the Nogheling River was not an impressive one, as we were so situated that only the lower end (Pl. III, fig. 1), where the shores are comparatively low, could be seen. When once on the lake itself, however, with an unobstructed vista of the greater part of its length, the view was magnificent. The mountains, which are from 500 to 1,000 feet in height at the lower end, extend along each side of the narrow stretch of water, and gradually become higher and higher and more and more rugged (Pl. III, fig. 2). In reality the peaks are not very high, but their gradual increase from the lower end of the lake to the upper, with the misleading vista effect, causes them to appear quite lofty. The higher peaks immediately surrounding the head of the lake are possibly of an altitude of 5,000 feet; others, farther back, which may be seen at a distance, are somewhat higher.

All the mountains on the south side of the lake and most of the others also are of eruptive origin and evidently date from no very remote geological period. Those about the upper end are steep and but slightly eroded, being too precipitous in most places to hold large snow banks. On the south side near the upper end, however, several small, high-hanging glaciers may be seen at the head of narrow canyons. On the north side for about 5 miles at the upper end, the mountains are slates, which are possibly exposures of similar formations known to occur to the northward in the main part of the Alaskan Range. At the lower end of the lake and also on the north side of the Nogheling River are several terraced beach benches, the apparent evidence of former occupation by salt water at receding levels. Much of the valleys of the Chulitna and Nushagak rivers is of a recent sedimentary character, doubtless once part of an old lake or inland arm of the sea. The whole region is only a little above the present



FIG. 1.—LOWER END OF LAKE CLARK.

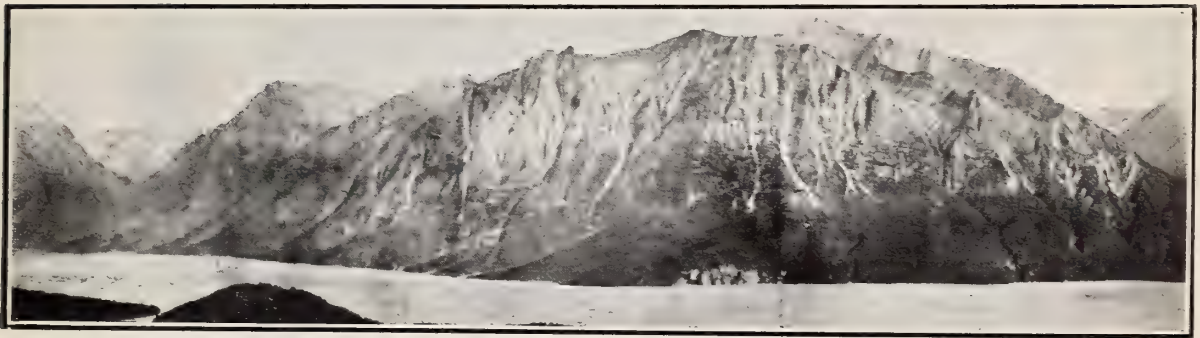


FIG. 2.—MOUNTAIN ON LAKE CLARK OPPOSITE MOUTH OF TLEEKAKEELA RIVER.



FIG. 3.—KEEJIK MOUNTAIN, NEAR KEEJIK, LAKE CLARK.

sea level. A very slight areal depression would allow the waters of Bristol Bay to occupy the basins of Lakes Iliamna and Clark and the greater part of the valleys of the Chulitna and Nushagak rivers.

Several fair-sized streams empty into Lake Clark at its upper end. All carry more or less silt and glacial wash, which give the waters of the entire lake and its outlet, the Nogheling River, a brownish-gray color. One of these streams, called by the natives the Tleekakeela, which comes in on the north side near the head of the lake, has deposited sand and silt in such quantity that a wide delta is formed which effectually blocks this side even at high water. As a result, the water above the delta is virtually cut off as an individual basin. Along the south side of the delta there is a strong current from the upper basin into the main lake through a channel not more than 200 yards wide. The Tleekakeela is navigable for a considerable distance for canoes or bidarkas. At some point on its upper course there is a difficult portage which is sometimes used in going to Cook Inlet in the vicinity of Tyonek. At the extreme head of the lake is another stream of fair size called the Chokotonkna. Various other streams drain to the lake on both sides from the upper to the lower end, the most important being Achteedeedung or Portage Creek, Keejik Creek, Koonthrashiboona River, and Chulitna River. We estimated the entire length of Lake Clark to be between 50 and 60 miles. The width varies from 2 to 8 or 10 miles, the widest part being about opposite the mouth of the Chulitna River. No soundings were made, but the water must be of a considerable depth, particularly on the south side, where the mountains rise abruptly from the water's edge. According to Schanz, one of the original discoverers, the bottom can not be reached within 100 fathoms. On the north side the lake is comparatively shallow, numerous gravelly beaches occur, and small islands are scattered along near the shore.

A good growth of timber surrounds the entire lake and runs up the mountain sides from 500 to about 1,500 feet. It is of much the same character as that at the head of Lake Iliamna. The black spruce (*Picea mariana*), which was not found about Lake Iliamna, however, is quite abundant on Lake Clark. This is particularly the case about the lower end of the lake, from the head of the Nogheling River to Keejik, where there is more or less low, moist ground suited to the tree. The aspen (*Populus tremuloides*) is also found in a few places near the Nogheling and about Lake Clark. On the steep mountain sides south of the lake the white spruce is the principal tree, and in many places composes the entire forest. On the north side it is also abundant, but the deciduous poplars and birches are largely mixed with it. This difference in the timber of the two sides is doubtless due to slope exposure. Many of the small, low peninsulas projecting into the lake on the north side are almost entirely occupied by groves

of poplars (*Populus balsamifera*), many individual trees slightly exceeding 12 inches in diameter. A beautiful open forest of birch and spruce is found in some localities, and much of the ground in such places produces tall grass (*Agrostis*) in great abundance. Devil's club (*Echinopanax*) occurs in a few dark, sheltered places near the head of the lake, and perhaps reaches the northwestern limit of its range there. Willows and alders abound in their respective relative positions, while smaller shrubs and boreal plants are in characteristic profusion.

LAKE CLARK TO NUSHAGAK.

The route now most frequently traveled between Lake Clark and Nushagak is by way of the Nogheling River to Lake Iliamna, and thence by the Kvichak River to Bristol Bay and around the coast or across country from Koggiung to Nushagak. Our route, which is more practicable for summer travel, was by the Chulitna River, across to the Nushagak drainage, and on down to the coast. This route was formerly used to a considerable extent when the region was inhabited by many more natives than at present. Now it is well known to the older natives only, and signs of travel along it are few and obscured by time.

The Chulitna is the largest stream emptying into Lake Clark. It enters on the northwest side, about 15 miles above the outlet of the lake. Its waters are of the dark amber color, characteristic of northern streams which drain tundra and semitundra areas; and its mouth, where the current is scarcely evident, might be mistaken for an arm of the lake, but for the sudden change in the color of the water. Looking upstream from the mouth of the river, the country appears comparatively level, as far as can be seen. On the right are a few low hills, spurs from the higher range along the lake; on the left also are scattered hills, outliers of the ridges which extend down the northwest side of the Nogheling River and Lake Iliamna. For several miles above the mouth of the river the country is low and swampy. At one place there are several channels traversing a wide, grassy swamp, the habitat of various waterfowl. Several days were spent here, while a fresh supply of provisions was brought up from a cache made on the Nogheling River. On August 10 we were ready to start up the Chulitna. Up to this time the weather had been comparatively mild and bright, with only an occasional squall. Now, however, there began a continuous rain, which for days and days did not abate for more than several hours at a time. Progress upstream, slow enough at best, was rendered more so by the disagreeable weather.

Owing to the low, swampy nature of the country near the mouth of the river, the timber consists chiefly of scrubby growths of black spruce, with clumps of birches and poplars on the occasional higher and drier spots. Some 8 or 10 miles up, however, the land, though

still low and comparatively level, becomes drier, and the banks of the stream are better defined. Alders and willows line the banks, and 40 or 50 feet back of them is nearly continuous forest of white and black spruce mixed with birch and aspen (Pl. IV, fig. 1). Occasionally the stream divides into several channels, and here the current is usually swift. A day and a half took us through most of the bad water, for, strangely, the swiftest part of the river is in its lower courses. On the third day there was less swift water, and good progress was made. Small areas of open mossy tundra were passed (Pl. IV, fig. 2). In the few places where the banks expose it, this mossy mat is seen to be from one to two feet in thickness, with gravels or clays beneath, apparent evidence that the region was once part of a lake or sea basin. Occasional small hills are seen, some with slight exposures of lava-like rock, but nearly all blanketed with moss. At intervals are thick clumps of white spruces, many of which are at least 50 feet high and about $1\frac{1}{2}$ feet in diameter. Another day through similar country brought us to Neekahweena Lake, which is a very beautiful little piece of water of an extent of 10 or 15 square miles. From the middle of the lake small detached mountains and hills can be seen in various directions and at considerable distances. One of these, an elongate, apparently flat-topped mountain, lying to the southwest, our native guide pointed out to us as his landmark, calling it the 'Portage Mountain.'

Nearly all the region about this lake is low and swampy. For 5 or 6 miles up the river the course is between dense thickets of alders and willows. Tall grass (*Agrostis*) grows very luxuriantly along the edges of the banks and well back into the thickets, being universally distributed except where tundra conditions prevail. For some 15 miles above the lake, the stream, which is very devious throughout, becomes particularly tortuous and winds and turns in a continuous series of convolutions. The 'Portage Mountain' alternated on all sides of us, and a small conical hill which in the morning appeared about half a mile ahead was not passed until late in the afternoon. Particularly fine clumps of white spruce were encountered along this part of the route; several trees were measured and found to be from 5 to 6 feet in circumference. Others noticed in passing were evidently somewhat larger than these. Four or 5 miles farther on the river suddenly narrows down to a uniform width of 40 to 60 feet (Pl. V, fig. 1), and flows canal-like, with a steady, even current, against which we were able to row with ease our heavily loaded canoe. The banks are covered with characteristic tundra vegetation nearly to the water's edge, but a thin line of spruce timber still persists near the border of the stream.

The mouth of the south branch of the river was reached after five days of travel from Lake Clark. With a light canoe and good weather

the trip might be made in three or three and a half days. The so-called South Fork of the river is much smaller than the main stream, and averages only about 15 feet in width. It is of nearly uniform depth, however, without shallow bars—a typical tundra stream. It was from 3 to 6 feet deep when we ascended, but several days later, when we last saw it, the continued rains had caused a rise of water of about 3 feet. It is bordered on each side by a thin line of spruce timber, behind which is practically open tundra with many small scattered ponds.

An entire day was occupied in ascending the south branch for about 9 miles to a big bend which lies about northwest of the 'Portage Mountain.' In many places the stream was so narrow that the canoe could barely be eased around the turns, and in others large trees had fallen across, blocking the way, so that the axe was in use almost as much as the paddles. Camp was made at the bend, and after several days' search Swan Lake was found and a portage route selected. During this time a trip was made to the top of the 'Portage Mountain,' from which an extensive view of the country was obtained. The mountain is about 1,400 feet above sea level and stands somewhat alone, being connected only by a low ridge with the mountains about the head of the Kakhtul River. From the summit one views to the eastward the broad, comparatively level region drained by the Chulitna, and to the westward a similar region along the Swan River. To the southward the course of the Kakhtul is easily followed from its source in the bare-looking mountains between it and Lake Iliamna to the vicinity of its junction with the Swan. From this elevated viewpoint one fully appreciates how closely the heavier growth of coniferous trees is confined to the banks of the streams. Although the water itself is only occasionally seen, both the Chulitna and the Kakhtul can be traced as far as the eye can distinguish by the lines of dark green spruce along their banks. The Swan is less easily followed on account of the small lakes which comprise most of its upper course. The whole region, in fact, presents a panorama of small lakes. It is reasonably safe to state that a thousand bodies of water of varying size and conformation can be seen from a single point on the top of the 'Portage Mountain.'

The land is largely swampy and is covered with typical tundra vegetation. Beneath the tundra throughout the region are waterworn rocks and coarse gravels, and along some of the hills are well-marked terraces of former lake or sea shore. The lakes or ponds are usually sunken a few feet below the general level. Around their banks is a somewhat better growth of dwarf birch and willow than elsewhere. In the occasional areas of higher and drier ground and on the low slopes and detached mound-like hills about the base of the mountain there is considerable spruce, which in protected 'draws' on the south



FIG. 1.—MIXED WOODS ALONG CHULITNA RIVER.

Trees: *Picea canadensis*, *Populus tremuloides*, *Betula papyrifera*.



FIG. 2.—SEMITUNDRA ALONG UPPER COURSE OF CHULITNA RIVER.

Trees in middle distance *Picea mariana*.



FIG. 1.—UPPER PART CHULITNA RIVER.



FIG. 2.—CHULITNA RIVER.

Picea canadensis being undermined by current.

side ascends to an altitude of perhaps 700 feet. A few cold streams course down the mountain, their narrow gulches crowded thickly with alders and the ground beneath luxuriantly clothed with grass. The open mountain sides, except in the rockier parts, are blanketed with reindeer moss and semi-procumbent shrubs, chiefly *Vaccinium*, *Arctos*, *Chamaecistus*, and *Salix*. Among the foothills poplars (*Populus tremuloides* and *P. balsamifera*) and birches (*Betula papyrifera alaskana*) are fairly common.

The route selected for the carry from the camp on the Chulitna to Swan Lake covered a distance of about 5 miles, half of it being over wet, boggy tundra and the remainder over comparatively hard ground. The divide between the drainages is scarcely more than 50 feet high. Swan Lake is clear and cold, and is about three-fourths of a mile long by one-third as wide; its depth is not more than 2 or 3 feet, except in a few holes. The bottom is diatomaceous ooze.

Leaving Swan Lake on August 27, we passed successively through six similar lakes and the short streams connecting them. The first ten hours of travel were disagreeable, as the shallow and tortuous streams made it necessary to wade and drag the heavily loaded canoe over a long series of gravel bars. Below the lakes the water of the Swan becomes deeper and flows in one general direction to the Kakhtul. It is a rather sluggish stream, however, as the much larger and swifter Kakhtul apparently backs up the water to some extent. At the junction of the Swan and Kakhtul we left temporarily the level country and passed between low ranges of hills, the one on the right being immediately adjacent to the river and that on the left lying about two miles distant and parallel. Near the mouth of the Kakhtul, that is, its junction with the Malchatna River, we camped for several days, being favored with definitely clear weather for the first time since leaving Lake Clark. The hills on each side of the Kakhtul are very similar to the 'Portage Mountain' near Swan Lake. Spruce timber of fair size is found along the immediate banks of the river and for considerable distances on the small tributaries, but the intervening country is open tundra. From the tops of the low hills on the right side of the river the view extends across to the valley of the Malchatna, which is much like that of the Kakhtul, but wider. To the southward toward Nushagak the view is unobstructed. As far as the eye can see, the country appears to be low and nearly level. Somewhat to the westward one lone but conspicuous hill of peculiar contour rises out of this low country. This is the so-called Tikchik Mountain, a well-known landmark for the natives and other travelers in the region.

Breaking camp on the Kakhtul September 3, we soon entered the flat country where the river, now considerably larger, begins to divide its channel as it passes around many small wooded islands. The current

is swift and the banks show many evidences of rapid dissolution and change. Early on the morning of September 4 the mouth of the Tikchik River was reached, and some much-needed provisions obtained at the cabin where remnants of the supplies of the defunct Trans-Alaska Company were for sale. Below the Tikchik the volume of water is much increased. Although there are many islands and long sand bars, the water seems to be of a depth sufficient for a small, light-draft steamboat, if carefully piloted, to navigate the stream. Although the country is for the most part low, the banks of the river, particularly on the northwest side, are frequently from 50 to 100 feet high. At the village of Kakwok about 25 natives were found, and nearly as many more were seen going upstream on hunting trips. They were in a very destitute condition, and many were much enfeebled or diseased. Ikwok, a small collection of igloos and caches a few miles above Kakwok, was found deserted, but with evidences of recent occupation, probably only temporary, by Kakwok natives. These were the only native habitations seen on the river. About 10 miles below Kakwok we began to observe indications of tidal influence, which, as we proceeded, rapidly became more marked. The lower part of the river is not peculiar. Along the banks considerable spruce timber is found all the way to Nushagak, though for the last 20 miles it is rather small and scattered. Within 30 miles of Nushagak, however, there are many good-sized clumps of white spruce, the trees averaging about 10 inches in diameter. Similar timber is said to be found along Wood River somewhat nearer to Nushagak. Birch and poplar are in great abundance, as well as alders and other characteristic Hudsonian shrubs, wherever conditions meet their various individual preferences.

The estuary of the Nushagak River is a wide bay traversed by swift tidal currents. At low water broad mud flats and long bars are exposed, particularly on the east side. Although good-sized vessels are able to enter the bay, navigation is difficult. A sandy bluff about 50 feet high begins a short distance above Nushagak and extends along the bay nearly to Point Etolin. Behind this bluff is a rolling country of the same general level, largely tundra, but with here and there clumps of small spruces. On the opposite shore of the bay considerable timber is seen scattered over low benches and irregular hills. In the distance appears a range of sharp-peaked mountains running about north and south, evidently the feeder of the Wood, Snake, and Igushik rivers. Late in September this range was covered with snow. Nushagak, or Fort Alexander, as it was formerly called, is the oldest of some eight or nine settlements which are clustered about various salmon canneries on the bay. From July to September, while fishing is in progress, it is a populous place; but during the remainder of the year it is practically a closed port, inhabited only by a half dozen watch-

men and traders, with the usual parasitic settlement of natives. It was formerly one of the best fur-trading stations in Alaska, and, indeed, still is, as the business can hardly be said to have decreased there more than elsewhere.

NUSHAGAK TO COLD BAY.

When Nushagak was reached, September 12, all the larger fishing boats were found beached and housed in for the winter. No suitable sailboats were to be had for the trip across Bristol Bay, and we finally decided upon the hazardous undertaking of coasting around to Koggiung in our own canoe. By great good fortune, however, a small schooner, which had been reported lost, suddenly appeared, and passage was engaged to Igagik. Start was made on September 26, and the next evening Igagik was reached. Here a salmon cannery is situated just inside the mouth of Ugaguk River and surrounded by a half dozen rude dwelling houses for the watchmen and a small collection of igloos or native huts. The region is low and treeless.

The Ugaguk River offered no great difficulties, as it is only a little more than 40 miles in length, and all but the upper 5 miles is affected by the tide. Starting at 6.30 a. m. on September 29, and stopping a half-hour for luncheon, we were still able to make camp only one mile below Becharof Lake at 2 p. m. of the same day. The lower part of the Ugaguk at flood tide has the appearance of any ordinary tidal slew. It begins to look more like a stream about 10 miles above its mouth, where there are a few low bluffs, which, however, are not continuous. The river is wide and contains many shallow stretches, where long sand-bars are doubtless exposed at ebb tide. The banks are lined with low, scrubby willows, with now and then a clump of small alders on an occasional higher and more protected bank. Often the banks are mere swamps only 6 inches or a foot above high-water mark. The stream cuts through a ledge of granite just as it issues from Becharof Lake. For about three-quarters of a mile the current is very swift, and many granite boulders project above the water. This stretch of swift water is called the Ugaguk Rapids. Several days were spent at the foot of the rapids, as high winds caused a strong surf to break along the beaches at the lower end of Becharof Lake, making it impossible to put off in a canoe. The country around the lower end of the lake is very desolate. A stretch nearly a mile in width immediately bordering the shore consists of sandy, wind-swept dunes almost devoid of vegetation except for thin irregular mats here and there on protected slopes. Farther back plant growth is more continuous, but very depauperate. The chief woody plants are *Empetrum* and several small species of *Salix*.

On October 4, during a temporary lull of the wind, the canoe was lined up the rapids and the journey continued around the end of the

lake to the south shore. After a long day of rowing, camp was made in a little bay near the northeast base of the volcano called by the natives Smoky Mountain. The lake is bordered by an almost continuous gravel beach, back of which are bluff-like hills clothed with tundra vegetation. Small willows are excessively abundant, and reindeer moss, Labrador tea, and crowberry are in great profusion. The alders at this time had shed their leaves, and at a short distance the scattered patches had the appearance of burnt ground. The willow leaves were turning yellowish, and some of the smaller plants reddish, and the whole effect was attractive. Continuing on the second day around the base of the mountain, we passed several stretches of high bluffs and rounded two or three rocky points and made camp on a narrow peninsula on the west side of the mouth of the long southern arm of the lake. On the following day, having threaded the small islands of the south arm, we continued on to the head of the arm and up a stream about one mile to a small subcircular lake at the base of the coast mountains. The course up Becharof Lake was along the south shore, and at no time was it more than a half mile from the beach. Along this route the water is seldom more than 15 feet in depth. It is very clear and cold, and the boulder-strewn bottom is easily visible all the way. The region about the head of the arm is rather swampy and is characterized by a luxuriant growth of grass (*Agrostis*), which in many cases reaches to a man's shoulders. A small collection of native igloos or barabaras is located near the mouth of the stream. There is another on the little lake where we camped and made ready for the portage across the mountains. These mountains form an irregular semicircle about the small lake. They are from 2,000 to 3,000 feet in height, and are rough and rocky except for the first 500 feet, where the rolling slopes are more or less covered with grass and dwarf shrubs.

The portage trail runs from the east side of the small lake across a half mile of swamp, and thence up about 1,000 feet, traversing a rocky pass and continuing on down over more rocks to the native village of Kanatak, situated just above high-water mark on the bay of the same name. This bay is frequently called Portage Bay, which seems ill-advised on account of the existence of a better known Portage Bay farther west on the same coast. Two days of hard work in stormy weather sufficed to transport impedimenta to Kanatak. A small rowboat was immediately loaded, and we coasted around the rocky shore of Shelikof Strait to Cold Bay, as this was the only hope of securing passage on the southbound mail steamer. Cold Bay was reached on October 13 after a hard passage and a very narrow escape in a sudden storm off Cape Kanatak. Here we waited until October 26, when the steamer arrived, being hospitably entertained meanwhile by



FIG. 1.—MOUNTAINS NEAR COLD BAY.



FIG. 2.—MOUNTAINS NEAR KANATAK.

Mr. J. H. Lee, who had charge of a small camp engaged in locating petroleum lands. Cold Bay is surrounded by bleak-looking mountains, in many places steep and bare, exposing sandstones and conglomerates (Pl. VI, fig. 1). A scanty growth of alder and willow is found along some of the streams, which are short, swift, and shallow. At the head of the bay there is a small area of level ground of a swampy nature. The hillside blanket of tundra vegetation is very thin, and the gravel or shingle beneath shows through in many places. Several low passes exist near Cold Bay, from which one looks down over a gently undulating descent to Becharof Lake, beyond which looms the snowy cap of the Smoky Mountain.

LIFE ZONES.

Practically all the region under consideration in the present paper lies along the border of the Hudsonian and Arctic zones. By using the actual limits of coniferous trees as a guide, the Arctic and Hudsonian may be sharply defined. The Arctic occupies the main part of the Alaska Peninsula southwest of the vicinity of Naknek Lake, together with a narrow strip northward along the coast of Bristol Bay and Bering Sea;^a the Hudsonian, stretches over the region to the northward on the mainland. Throughout most of the part which may be assigned to the Hudsonian there are frequent occurrences of apparent Arctic intrusions in so-called faunal islands. Tundra conditions, in more or less insular form, occur throughout the Hudsonian zone, and in this border country are merely more numerous and extensive than farther south. By tundra is meant absolutely treeless country, where vegetation forms a thick mat consisting largely of mosses, lichens, saxifrages, dwarf willows, and such small plants as *Empetrum*, *Ledum*, *Andromeda*, *Chamaecistus*, *Vaccinium*, *Arctos*, and *Dryas*. Throughout the Hudsonian of this region such tundra is found in patches varying in size from a few acres to several square miles. About the upper end of Lake Iliamna, which may be regarded as a timbered region, there is considerable tundra, and the lower end of Lake Clark presents similar conditions. The valley of the Chulitna River, though containing much timber, some of it of fair size, is largely a tundra region, except along the immediate border of the stream and its more important affluents. Along the Nushagak drainage the subordination of the forest is still more pronounced, and the coniferous trees are strung out in thin lines confined to the very banks of the water courses. The accompanying map (Pl. VII), intended to indicate the limits of the coniferous forest, obviously fails, in the nature of the case, to show this mixture of forest and tundra, and pre-

^aThe extension of the Arctic zone to Bristol Bay was recognized by Nelson in 1887, when an 'Alaskan-Arctic' was defined to include the 'treeless coast belt.' See Natural History Collections in Alaska, U. S. War Dept., pp. 27-32, 1887.)

sents only a somewhat generalized boundary along the front of the region in which timber grows.^a

The Arctic and Hudsonian faunas appear to coincide reasonably well with the limits of the treeless and timbered regions. This delimitation of the coniferous trees, therefore, may fairly be used to mark the boundary between the Arctic and Hudsonian zones. Of the mammals found in the treeless region about Bristol Bay and the base of the Alaska Peninsula, the most characteristic Arctic species are the pied lemming (*Dicrostonyx*), the Arctic hare (*Lepus othus*), and the Arctic fox (*Vulpes lagopus* subsp.). Besides these, the following marine Arctic mammals which occur along the coast should be mentioned: *Delphinapterus*, *Balaena*, *Erignathus*, and *Odobenus*. Among Arctic birds known to breed as far south as Nushagak are: *Stercorarius parasiticus*, *Polysticta stelleri*, *Somateria v-nigra*, *S. spectabilis*, *Charadrius d. fulvus*, *Squatarola squatarola*, *Crymophilus fulicarius*, *Lagopus lagopus*, *Acanthis h. exilipes*, *A. l. holbælli*, *Calcarius l. alascensis*, *Passerina nivalis*, and *Budytes f. alascensis*.

The Hudsonian division of the region of the base of the peninsula has in general the same fauna found throughout this zone in Alaska. Practically the entire fauna reaches to the very edge of the zone—that is, to the limit of coniferous trees. Some genera, and doubtless also some species, extend into the Arctic for considerable distances or throughout. Among these genera are *Citellus*, *Evotomys*, *Microtus*, *Rangifer*, *Gulo*, *Lutra*, *Putorius*, and *Sorex*. Such forms are very wide-ranging, for, as has been stated in a previous paper,^b the fauna of the Hudsonian zone in Alaska is not characterized by peculiar forms, but consists largely of genera, and in many cases of species, which continue on from the Canadian. Those common to the Arctic and Hudsonian, therefore, also occur in the Canadian and are common to all three. Among Hudsonian genera of mammals which do not enter the Arctic in this region are *Sciurus*, *Synaptomys*, *Mustela*, and *Ursus* (subgenus *Euarctos*).

The distribution of the races of native people in this region shows an interesting agreement with that of the plants and lower animals. The true Eskimos extend down the coast of Bering Sea to the vicinity of Nushagak, and are represented on the peninsula by the Aleuts, who are generally regarded as modified Eskimos. The Indians of undoubted derivation from pure Athabascan stock occupy the greater part of the region here assigned to the Hudsonian. At present Eskimos, Aleuts, and Indians are much mixed in the vicinity of the base of the peninsula. Under more primitive conditions the Eskimo tribes undoubt-

^a For information as to forest conditions in various parts of the region not visited by our party in 1902, I am indebted to L. L. Bales, of Seattle, Wash., and to A. G. Maddren.

^b North American Fauna, No. 21. p. 59, 1901.

edly occupied the Arctic zone almost exclusively, while the Indians remained in the timbered Hudsonian region.^a

"The boundaries of the several zones rarely coincide with absolute mechanical barriers, being fixed in the main by temperature."^b In the case of the Hudsonian and the Arctic, the line between the timbered and the treeless regions offers a sharp boundary which, with regard to the respective faunas, seems to be effective to a considerable degree. So far as the region immediately adjacent on either side of this boundary is concerned, it seems probable that temperature is not so effective in restricting the faunas as the local environment. That is, the animals peculiar to the treeless Arctic and those characteristic of the timbered Hudsonian, while doubtless restricted to their general ranges by temperature, are confined in the vicinity of the boundary, respectively, to the Arctic because it is treeless, and to the Hudsonian because it is timbered, rather than as the result of any appreciable difference in temperature on either side of the dividing line. Along the boundary line between two zones where there are no important controlling factors except temperature, there is usually a belt in which occurs an overlapping of animal forms. This overlapping between the Hudsonian and Arctic zones is minimized by the difference in external conditions other than temperature. For the general areas of the two zones, temperature is of course the chief controlling factor. Points on the Yukon River in the heart of the Alaska Hudsonian, for example, are known to be decidedly different from points in the Arctic like St. Michael, both in respect to the hottest part of the year and to the total quantity of effective heat. Although there are no records in confirmation, it hardly seems possible that there is a corresponding or even an appreciable difference of this sort between the timbered Hudsonian around Lake Clark, for example, and the treeless Arctic region around Becharof Lake.^c

The coniferous trees themselves are doubtless in the same manner restricted in their general range by temperature, but along their extreme limits other factors must have considerable effect upon them. This is particularly true in the Alaska Peninsula region where the limit is a southern rather than a northern one. Just what are all the causes determining the nonexistence of coniferous trees on the greater

^a See Nelson, *The Eskimo About Bering Strait*, 18th Ann. Rept. Bur. Am. Ethnology, p. 23, 1900, in which it is stated that "the western Eskimo described in the present work is found mainly within the limits of the area which I have designated elsewhere as the Alaskan-Arctic district."

^b Merriam, *Laws of Temperature Control of the Geographic Distribution of Terrestrial Animals and Plants*. < Nat. Geog. Mag., VI, p. 230, 1894.

^c St. Michael and Holy Cross Mission, for which there are some temperature records, occupy nearly the same relative positions, one being on the treeless coast and the other just within the timber limits. The difference in their effective temperatures is practically nil.

part of the peninsula can hardly be ascertained until more work is done. Possibly one of the most effective checks to the extension of timber southward is the prevalence of wind and storm regardless of temperature. The topography and situation of the peninsula are most favorable for stormy weather. Being long and narrow, with a ridge of high mountains extending throughout its length, and situated as it is between Bering Sea and the North Pacific Ocean, it must necessarily receive at nearly all seasons the force of many atmospheric disturbances. In the fall it is swept by fierce winds, whether the temperature be moderate or not. Such conditions would restrict arborescent vegetation in almost any latitude. It is possible that, in spite of these adverse circumstances, the timber may be advancing along the peninsula and that it may ultimately extend much farther than now. There are, of course, no data on this subject; and any such would be difficult to obtain, for the growth of individual trees is extremely slow and any general movement could scarcely be detected except by observations at great intervals.

A more extended study of the Alaska Peninsula and the Aleutian Islands southwest of it may show that the region as a whole merits recognition as a separate faunal district, but if so it will certainly be as a subdivision of the Arctic. Such a district was recognized by Nelson,^a but the animals noted as characteristic are merely geographic forms of well-distributed mainland genera and species, chiefly produced by isolation, and not such as could be used safely to characterize anything more than a district of subordinate rank.

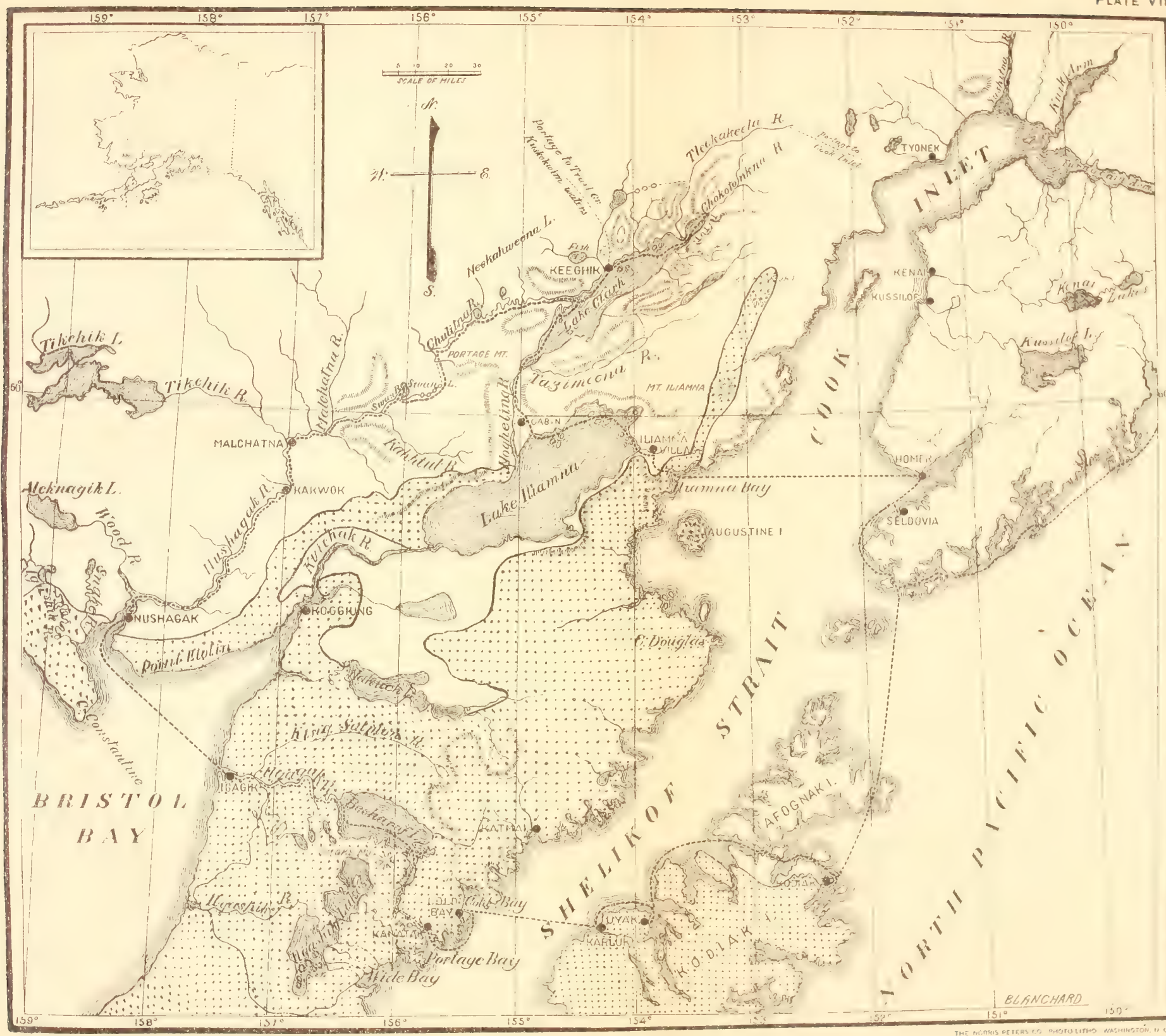
Although the mean annual temperature of the peninsula and Aleutian region is much higher than that of the more northern treeless region, the effective temperatures do not differ to any degree. Fortunately there are observations enough to make this reasonably certain. Unalaska may be taken to represent the peninsula and Aleutian region, and St. Michael the undoubted Arctic farther north. The means for the four hottest months (June, July, August, and September) at St. Michael are as follows: 46.3°, 53.6°, 51.9°, and 43.9° F. For the same months at Unalaska: 46.3°, 50.6°, 51.9°, and 45.5° F. These records were based on eleven years' observations at St. Michael and six years at Unalaska.^b From this it appears that the temperature of the hottest part of the year is practically the same at the two places. Moreover, these four months are the only ones at either locality in which the mean temperature exceeds the minimum of 6° C. (= 42.8° F.).^c Therefore the total quantity of effective heat is essentially the same.^d

^a Natural History Collections in Alaska, U. S. War Dept., p. 27, 1887.

^b Henry, Climate of Alaska, Bul. No. 62, Office Exp. Stations, U. S. Dept. Agriculture, p. 51, 1899.

^c See Merriam, Laws of Temperature Control, loc. cit., p. 231.

^d It would be slightly different if the minimum were reduced from 6° C. to 0° C.



LIFE ZONES AND DISTRIBUTION OF CONIFEROUS TREES.

Dotted area represents Arctic zone beyond limit of conifers. Undotted area represents Hudsonian zone characterized by coniferous trees.

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In consideration of this agreement of effective temperatures and the occurrence of numerous, distinctly arctic mammals and birds, it seems safe to include the Alaska Peninsula, particularly the northeastern part of it, in the unqualified Arctic Zone.

PREVIOUS WORK.

Nushagak, or Fort Alexander, as it was known formerly, was one of the early stations of the Signal Service of the United States Army in Alaska. Through the well-directed efforts of Prof. Spencer F. Baird, Secretary of the Smithsonian Institution, the observers selected for these stations were young men interested in natural history and qualified to make good use of valuable opportunities during the time not devoted to meteorological work. Under orders issued April 11, 1881, C. L. McKay was sent to establish the station at Fort Alexander. For the two years following he spent considerable time in natural history work, and made valuable collections in several branches. On April 19, 1883, he went out on the bay with some natives in a small boat, and in some mysterious manner the craft was capsized and the unfortunate naturalist drowned.^a His collection of birds and mammals, numbering about 400 specimens, was transmitted to the National Museum, where many of them are still preserved, while others have been distributed or sent in exchange to other institutions. The mammals numbered 59 specimens belonging to 23 species as recognized by F. W. True, who published a briefly annotated list of them in 1886.^b Those of importance have been referred to again in the present paper. No account of the collection of birds as a whole has been published, but scattered references to various species have appeared from time to time, usually in lists of specimens. The entire collection was recorded in the National Museum catalogues, however, and so far as there are specimens for confirmation, the specific names entered are nearly all correct.

Since it relates to the same region in which McKay worked, this paper contains frequent references to his specimens, particularly in the cases in which his work supplemented my own. Such instances are quite numerous in the case of birds, owing to McKay's opportunities for collecting at all seasons. Among many interesting species in his collection was the beautiful snowflake (*Passerina hyperborea*), which is now called the McKay snowflake. His botanical specimens also went to the National Museum, and formed the basis of a list of 123 species published in 1885 by Dr. F. H. Knowlton.^c McKay was unquestionably a careful and enthusiastic collector, and his

^a Rumor at Nushagak still persists to the effect that the drowning of McKay was brought about by foul means.

^b Proc. U. S. Nat. Mus., IX, pp. 221-224, October, 1886.

^c Proc. U. S. Nat. Mus., VIII, pp. 213-221, 1885.

accidental death at an early age was a distinct loss to science. He evidently made numerous short excursions from Nushagak, and among the localities thus visited were Lake Aleknagik and Ugashik. He also made a trip over a considerable part of the route traveled by our party. He visited Lake Iliamna and Iliamna Village, and, according to an account received from a native, crossed the Chulitna portage. By a strange coincidence, the same native who, as a young man, accompanied McKay on this trip, went with us from Lake Clark to Swan Lake, and related to us various incidents of the trip made twenty years before. By another coincidence, while at Nushagak we lodged in the old log house which was the home of McKay. On some shelves in one of the rooms we found, still untouched, several pounds of his arsenic and some of the old station records of his meteorological work.

McKay was succeeded by J. W. Johnson, who was ordered from Washington, D. C., to Fort Alexander, on April 21, 1884, and directed to return from there April 12, 1886. Johnson made natural history collections, including 125 specimens of birds, which were sent to the National Museum. In all important cases these have been recorded in the present list.

Aside from the natural history work of McKay and Johnson, nothing of importance, previous to 1902, was done anywhere in the region of the base of the Alaska Peninsula.

LIST OF MAMMALS.

?*Balæna sieboldi* (Gray). Pacific Right Whale.

The carcass of some species of baleen whale was washed ashore early in September, 1902, between Kanatak and Wide Bay. When we arrived at Kanatak the natives had secured great quantities of the blubber. This they had cut in strips and chunks and hung up in most of the available places about the village. Our natives, who came with us from Igagik, were much elated at the chance of securing some of the blubber. They lost no time in bargaining for a small quantity, which they carried back with them, intending to use the oil to grease their bidarkas. For this purpose they say it is far superior to the seal oil, which they ordinarily use. Two white men from Cold Bay visited the carcass and secured the baleen from one side of the jaw, the other half having been washed away. They estimated by pacing that the animal was about 63 feet in length. The baleen was rather coarse and short, the largest pieces being not more than 2 feet in length. The amount secured weighed approximately 250 pounds.

Delphinapterus leucas (Pallas). White Whale.

White whales or belugas often come into the mouth of the Nushagak River or the neighboring small bays in pursuit of salmon, on which it is said they feed quite extensively. When a school appears, the natives become much excited and make every effort to secure as many as possible. The skins of the belugas are highly valued, particularly for covering kyaks and bidarkas. Belugas are said to occur also on the south side of the peninsula, about the mouth of Cook Inlet.

Phocæna phocæna (Linn). Harbor Porpoise.

Two skulls of the common harbor porpoise, secured from the natives of Kanatak, were added to our collection by A. G. Maddren in the fall of 1903. So far as I can learn, this is the most northerly record of this species on the Pacific coast.

Rangifer granti Allen. Peninsula Caribou.

Signs of caribou were seen at the upper end of Lake Clark, along the Chulitna and Kakhtul rivers, and near Becharof Lake. The animals were formerly very abundant in all this region, but are now much reduced in numbers. Their distribution, however, is undoubtedly continuous from the peninsula to the mainland of Alaska by way of

the region of lakes Iliamna and Clark, and the idea that the supposed species *granti* is entirely isolated from the other caribou of Alaska is unquestionably erroneous." The few tracks of caribou seen were those of solitary individuals or of very small bands of five or six. Several caribou were killed by natives in July, 1902, some 20 miles northwest of Keejik, Lake Clark. One was also killed in July by a prospector about 15 miles northeast of Cold Bay. During the winter of 1901 a herd of 20 was seen by natives between Becharof and Ugashik lakes, and several were killed, and in the winter of 1902-3, 7 were killed on Becharof Lake near Smoky Mountain. Two skulls, labeled 'Nushagak,' secured by McKay in 1882, are in the National Museum. They were doubtless procured by natives at some distance from Nushagak. A party of natives, encamped near us at the mouth of Becharof Lake, were engaged, in the latter part of September, in a caribou hunt. During two weeks of steady work six hunters succeeded in killing a total of 6 animals. Their method is a lazy one, but with unlimited time gives a fair degree of success. They built a small, innocent-looking cairn of rocks on the summit of a hill a few hundred yards from their camp, to which one of them would go every hour or two and scan the surrounding country. In case a caribou was sighted, the whole party would then go out to stalk it. The animals are very light-colored at this season and are easily seen at a long distance.

The large herds which occur farther west on the peninsula do not, as a rule, come as far east as Becharof Lake, although small herds are scattered all along. These herds are being rapidly killed off both by white men and natives, and at the present rate the caribou of the Alaska Peninsula bid fair to be exterminated in a comparatively short time. Nearly the year round they are brought in regularly to all the mining and fishing camps along the peninsula, being hunted not only for their flesh but also for their skins, which are in great demand. The mail steamer which runs along the south side of the peninsula takes on a supply of caribou meat on nearly every trip. The animals are usually killed in the Port Moller region, and the carcasses taken to the mining village of Unga, where the steamer makes regular stops. On the October run, when I was a passenger, caribou chops, roasts, and stews were a feature of the bill of fare. On each trip since then a good supply has been on board. On the December run 9 carcasses were secured at Unga for consumption on the vessel, and in January about the same number were consumed, as I am informed from reliable sources. In September, 1902, a trading post was established at Unan-gashik, east of Port Moller, on the north side of the peninsula, for the express purpose of trading for caribou skins. A stock of goods representing an investment of about \$1,000 was put in, and a man placed

"See Allen, Bul. Am. Mus. Nat. Hist., XVI, p. 127, March 31, 1902, and Grant, 7th Ann. Rep. N. Y. Zool. Soc., p. 15, 1902.

in charge. One of the employees of the proprietor of this station informed me that the receipt of about 1,000 caribou skins was confidently expected during the following year. Since then I have learned that approximately 500 caribou were killed by the natives of Unangashik between October 1, 1902, and May 1, 1903, and the skins disposed of to the trader. These skins are not shipped out of the country, so the traffic in them is only locally known. The trader pays about \$1 in trade for a skin, which is worth to him from \$2 to \$5. The skin of the body is widely used for clothing and bedding material. The short-haired skin of the legs is especially desired for making the tops of the skin boots which are very extensively used by natives and whites alike. This traffic is carried on openly. The occasional killing of caribou out of season by natives and prospecting parties can not be stopped, nor does it seem necessary that it should be. If the wholesale traffic in meat and hides, however, is not checked, the animals are surely doomed to speedy extinction.

The Aleut name for the caribou is Tooótoo; the Indians call it Búdga.

***Alce americanus gigas* (Miller).** Alaska Moose.

Moose are found in comparatively small numbers in the region of Lakes Iliamna and Clark. Near the head of Lake Clark two weather-beaten shed antlers were found on a wooded flat, and old tracks of one animal were seen near there. The natives say that moose are not often killed in this vicinity and were not abundant in times past. We saw more signs of them on the upper Chulitna River, where in several places near the portage to Swan Lake fresh tracks were found in the soft mud on the banks of small streams. A few signs were also seen on the Kakhtul River. The natives of Nushagak frequently go up the Nushagak River on hunting trips, but do not often bring back moose, as caribou and smaller game are much more abundant. Moose are scatteringly distributed on the Alaska Peninsula and extend farther west than has been generally supposed. In a native's camp on the Ugaguk River I saw fresh meat and pieces of the skin of a moose which was killed about October 1 on the upper waters of the King Salmon River, a northeastern tributary of the Ugaguk. One of our guides, an intelligent half-breed from Igagik, said that he killed two small moose near the Ugashik lakes in the fall of 1901. During the spring of 1903 A. G. Maddren received reports that nearly 20 moose were killed by natives in the vicinity of the Naknek River. A moose was said to have been killed several years before as far west as Port Moller, but no confirmation of the report could be obtained. There is no spruce timber near any of these localities except the Naknek River, and very little there. Along the King Salmon River and about the Ugashik lakes, however, there is a considerable growth of poplar and willow and possibly some birch, and the moose are found

there regularly. If they ever do occur as far west as Port Moller, it must be only as stragglers. As to the westward distribution of the moose, Mr. Maddren, from his experience in 1903, writes as follows:

In regard to the moose extending down the peninsula beyond the limit of spruce, it seems to me their range is governed by the limits of the birch which they eat. Birch extends beyond the limits of the spruce, growing thickly on the Naknek River and over into the valley of the King Salmon. This is practically the limit of moose range, though a few may wander down south of Becharof as stragglers, but no quantity of birch grows south of Becharof Lake.

The Indians of Iliamna call the moose Kóchtai, and the Aleuts at Igagik have it Toondoókbuk.

Ovis dalli kenaiensis Allen. Kenai Sheep.

White sheep are found in small numbers in the mountains between Lake Clark and Cook Inlet, and are probably more or less continuously distributed from there northward along the Alaskan Range. They are not reported from the mountains near Iliamna Bay, so it is probable that they do not occur farther west than the vicinity of Lake Clark. In winter they are said to come to the mountains immediately bordering Lake Clark, but at the time of our visit, in July, they had crossed to the next range to the eastward. I found one old weather-beaten skull in the mountains near the head of the lake. Two specimens are in the National Museum, collected by McKay in the 'Chigmit Mts.' This locality perhaps refers to the mountains near Iliamna Village, where it is probable McKay obtained the specimens from the natives. I have examined one of these specimens and find it referable to the subspecies *kenaiensis* rather than to true *dalli*. *O. d. kenaiensis* appears to possess other characters besides the slight cranial peculiarities noted in the original description.^a Most noticeable of these is the color of the upper side of the tail, which is dusky or brownish in true *dalli* and pure white in *kenaiensis*. The horns of *kenaiensis* average thicker at the base, particularly on the lower side, and less divergent at the tips than in *dalli*. I have not examined specimens of *kenaiensis* in all pelages, but in those seen there is no mixture of dusky hairs on the back and sides as in *dalli*, the pelage being entirely pure white except for extraneous stains.

The Indians of Lake Clark call the white sheep Noótyee.

Sciurus hudsonicus Erxleben. Hudson Bay Red Squirrel.

Red squirrels were found sparingly in the timbered regions. Their characteristic nests were seen only occasionally, and their chattering calls, usually such a feature of travel in the northern woods, were not often heard. This scarcity of red squirrels is doubtless because they reach the extreme western limit of their range in this region. Speci-

^a Allen, Bul. Am. Mus. Nat. Hist., XVI, p. 145, April 23, 1902.

mens were taken at the following localities: Nogheling Portage, Lake Clark (near head), mouth of Chulitna River, Neekahweena Lake, south fork Chulitna River, Kakhtul River (near Malchatna junction). These are all referable without hesitation to true *Sciurus hudsonicus*.

The Indians of Lake Clark call the red squirrel Tsilkár.

Citellus plesius ablusus Osgood. Nushagak Ground Squirrel.

Citellus plesius ablusus Osgood, Proc. Biol. Soc. Wash., XVI, pp. 25-26, Mar. 19, 1903.

Spermophiles were found on the higher ground all along our route. The first seen were on the hillsides on the north side of Iliamna Pass, some in comparatively bare rocky places and others in little swales where the tall grass partly sheltered them from view. They were not found in the low country in the immediate vicinity of Iliamna Village, nor between there and the upper part of Lake Clark. Scattering individuals were found on the mountains about the head of Lake Clark, and a few specimens were taken there. A few pairs were found occupying a short stretch of beach on Lake Clark, where their burrows were made in sandy sediment so soft and fine as to seem almost impracticable for the purpose. They also occur on the hills back of Keejik, whence one specimen was brought by an Indian boy who had been keeping it as a pet. Spermophiles were not seen along the Chulitna River, which flows through low, swampy country, but the natives report their occurrence on most of the higher ground in the vicinity.

Several small mountains, visible from Neekahweena Lake, are said to be inhabited by spermophiles of a larger size than those ordinarily found in the region, and therefore particularly sought by the natives. A more or less continuous colony of several hundred individuals was found about the Chulitna-Swan portage, extending from the north slopes of the 'Portage Mountain' around the upper end of Swan Lake. Several specimens were taken there. Others were taken on low hills near the Kakhtul River, and again at Nushagak and Cold Bay. In 1903, A. G. Maddren secured others in the Becharof Lake region. At Nushagak spermophiles were found on sandy bluffs along the river. Their burrows frequently opened on the side of the bank, 2 or 3 feet below the top, and trails from them led to the top and down the bank to the narrow beach. Sometimes the animals were seen sitting in front of such burrows, where they commanded a wide view over the water, and barked vigorously at passing boats. At other times they were startled on the beach, or even on the tidal mud flats, when they would scurry in great alarm up the side of the bluff to their burrows. Several living specimens from this colony at Nushagak were taken to Unalaska and liberated some years ago by Mr. Samuel Applegate, of the United States Signal Service. The colony has since prospered, and numerous specimens have been secured for the United States

National Museum by various Government parties. Specimens taken on Lake Clark in July are in a fresh but short-haired pelage; those taken in late August and early September are changing to a much longer, fuller pelage, in which the buffy colors are reduced in intensity or replaced by grays. October specimens from Cold Bay are entirely changed and the buffy under color of the preceding pelage has been entirely replaced by grayish white. The Cold Bay specimens are not typical *ablusus*, but at present can be referred to no other form. The animals were more or less active at Cold Bay as late as October 18, although comparatively cold weather was prevailing. Six adults were weighed before skinning, with the following results: Males, $1\frac{1}{2}$ pounds, $1\frac{1}{4}$ pounds, $1\frac{1}{4}$ pounds; females, $1\frac{1}{4}$ pounds, 14 ounces, 14 ounces.^a

In the Aleut dialect, sometimes used by the natives at Iliamna village, the spermophile is called Anánuchgh; in the Kenai Indian of the same place, Koónschar; and in the dialect spoken at Igagik, Kanánuk.

Marmota caligata (Eschscholtz). Hoary Marmot.

The 'whistler' is said to occur on the mountains about Iliamna Bay and is also reported from the hills back of Keejik on Lake Clark. We failed, however, to find it on the mountains around the head of the lake. It lives in small colonies, and may be abundant on one particular mountain and entirely absent from all the others in the vicinity. A solitary mountain visible from Neekahweena Lake is said to support such a colony, and others are said to occur similarly on individual mountains near Kanatak and Cold Bay. One specimen, a skull from Kanatak procured by W. J. Fisher of Kodiak, is in the Biological Survey collection, and 16 others from the same locality are among the specimens received from the Kanatak natives by A. G. Maddren. McKay's collection contained two specimens from Aleknagik Lake.

The Indian name for this species is Skoótlah, and the Aleuts call it Chigíghbúk and Kangánughbúk.

Castor canadensis Kuhl. Beaver.

Three beaver lodges, evidently being used, were seen on the Chulitna River, two on the lower river below Neekahweena Lake, and one on the south fork near the Swan portage. Tracks in soft mud banks and fresh cuttings of alder and willow bushes were seen quite frequently. We had no large traps, and time was very valuable, so no attempt was made to trap the animals, although several unsuccessful nocturnal expeditions were made in the hope of obtaining a shot at one. The lodges were small and perhaps occupied temporarily, each by only one animal. They were roughly dome-shaped, about 6 feet in diameter and 3 to 4 feet high, having been excavated on the inside some-

^aThese weights, as well as those of other species, were secured with spring scales, which have been carefully tested and found to be reasonably accurate.

what below the level of the top of the bank. The mud floor sloped toward the exit, which seemed barely large enough to admit a medium-sized beaver. There was no air of coziness about the interior, as all was cold, dark, and wet. The extensive region of low land about the sources of the Chulitna River is covered with hundreds of small lakes and ponds connected in most cases by small, sluggish streams eminently suitable for beavers, and no doubt a great many are still scattered throughout this area. Our natives noted the location of the lodges with a look in their eyes that meant a return when the season was more favorable for trapping, and no doubt a few weeks later they were doing their best to thin out the remaining animals. No signs of beaver were seen on the Swan and Kakhtul rivers, but the animals are said to occur on some of the smaller streams in the vicinity. A small isolated colony still exists high up on the side of the Smoky Mountain or Mount Peulik, near Becharof Lake. Specimens of skulls from this mountain were secured from natives. A small number of skins are brought annually to the trader at Nushagak.

The Aleut name for beaver is Parlúktuk; the Indians call it simply Choo.

[**Mus norvegicus** Erxleben. Norway Rat.

Although large sailing vessels have been visiting Nushagak for a number of years, rats have seldom escaped from them, since there are no wharves, and anchorage is at some distance from shore. A few, however, have sometimes been found about the warehouses and lumber piles, but they have never become established.]

Evotomys dawsoni Merriam. Dawson Red-backed Mouse.

Red-backed mice were found in abundance at all points visited, and a large series of specimens was collected. They seem to be the most universally distributed of any of the mice of the North, not only ranging over a great area, but occupying every variety of local habitat within this range. Thus they replace in the North the ubiquitous white-footed mice of more southern distribution. In a good-sized series, mainly from Iliamna Village, Kakhtul River, and Nushagak, there are some slight and inconstant variations in cranial characters, but taken collectively specimens from this region do not materially differ from supposed typical *dawsoni* from the upper Yukon River. Nushagak specimens, as a rule, have slightly shorter and broader nasals than Yukon specimens, but individual variation in this respect is considerable. A small series from the Ugaguk River near the outlet of Becharof Lake are uniformly of small size, indicating the possible existence of a peninsular form, the validity of which may be established by future collections from more western parts of the Alaska Peninsula. In connection with the identification of the Nusha-

gagak series, all the immediately available specimens from northern Alaska were examined, several hundred in number. From a study of these it appears that the slight cranial peculiarities supposed to characterize specimens from St. Michael, which have been called *alascensis*, are covered by individual variation. Indeed, this variation, upon reexamination, is found to exist in the St. Michael series itself, so that *alascensis* should be considered a synonym of *dawsoni*. The reference of Nushagak specimens to *dawsoni*, therefore, is not unwarranted by geographical considerations. Throughout the series examined there is extremely little variation in color. The winter pelage is shown by October specimens from the Ugaguk River, Becharof Lake, and Cold Bay. It is brighter and clearer reddish on the back and paler on the sides than the preceding pelage.

***Microtus operarius kadiacensis* (Merriam). Kodiak Vole.**

Voies of the '*operarius* group' were found all along our route, but were rather uncommon except at Nushagak and the region immediately surrounding the mouth of the Nushagak River. Specimens were taken at the following localities: Iliamna Bay, Iliamna Village, Lake Iliamna at Nogheling Portage, head of Nogheling River, mouth of Chulitna River, head of Chulitna River, Kakhtul River, Kakwok, Nushagak, Becharof Lake, and Cold Bay. At Nushagak they were exceedingly abundant and fairly swarmed about the houses in the village as well as in much of the surrounding country. They invade the vegetable gardens and do considerable damage, particularly to potatoes, which they dig out and carry to underground storehouses. The Indian boys at Kanulik, near Nushagak, found several of these places well filled with small potatoes. The trails of the voles and the small mounds of earth in front of their burrows were found from the hillsides to within a few feet of high-water mark on the beach. It was scarcely possible to walk 50 yards anywhere in the vicinity of the village without encountering signs of them. Evidently they continue to breed until the beginning of winter weather, as small young were taken in September. One very tiny little fellow was found one cold, rainy evening, doubtless having wandered so far from the nest that he was unable to find his way back. He was so small that his weight was easily supported by the blade of coarse grass on which he was perched. A large series of specimens was taken at Nushagak, and scattering individuals at other points along the route. All of these seem to be more similar to *kadiacensis* than to typical *operarius*, though to a slight extent they partake of the characters of each. From the examination of a very large series of both it appears that in color *operarius* and *kadiacensis* are absolutely alike, and that in cranial characters they are very closely related. The cranial characters are not invariable, but seem to hold true in the majority of cases. In *kadiacensis* the skull

is larger, slightly wider, the audital bullæ are a trifle larger, and the teeth are larger. The Nushagak specimens are fully equal in size to those from Kodiak, and have large teeth as well. The audital bullæ average slightly smaller than in Kodiak specimens, possibly on account of a tendency toward typical *operarius*.

Microtus pennsylvanicus drummondi (Aud. & Bach.). Drummond Vole.

The Drummond vole was found to be rather rare in the region we worked. One specimen was taken on Lake Clark, near Keejik, 5 near the mouth of the Chulitna River, and one on the Kakhtul River, near its junction with the Malchatna. These localities doubtless represent the extreme western limit of the range of the species, from which it may safely be assumed that it is found over the large area between Lake Clark and the Yukon, along the drainage systems of the Kuskokwim and Tanana. The western specimens are typical *drummondi*, and agree perfectly with others from the Yukon River previously referred to this species.

Fiber spatulatus Osgood. Northwest Muskrat.

Muskrats are common in suitable localities throughout the region. Conditions are particularly favorable for them in the wide expanse of grassy swamp just above the mouth of the Chulitna River. Several were seen swimming along the bank in this vicinity, and also at other points on the river. Specimens were taken near the head of Lake Clark, at the mouth of the Chulitna River, and near the head of Becharof Lake. They are said to be very abundant at some points not far from Nushagak and on one or two of the smaller tributaries of the Ugaguk River. Specimens were taken by McKay at Nushagak and Ugashik, and 11 complete specimens from Becharof Lake were secured in 1903 by A. G. Maddren. The measurements of an adult male from Lake Clark are as follows: Total length, 512; tail vertebræ, 225; hind foot, 69. The weights of 2 females are $1\frac{3}{4}$ pounds and $2\frac{3}{8}$ pounds, respectively.

In Aleut, as spoken at Iliamna Village, the muskrat is called Éligwagh; as spoken at Igagik, it is Kughwä'luk, and in the Kenai of the Lake Clark Indians it is Toochoódah.

Synaptomys dalli Merriam. Dall Lemming Mouse.

Our first night's trapping at Iliamna village yielded several lemming mice and later more were taken at the same place. They were again found near the mouth of the Chulitna River, near the head of the south branch of the Chulitna River and on the Nushagak River near Kakwok. They were usually found in small colonies in very wet swampy places, preferably in wet moss. They undoubtedly make their own runways, but share them to some extent with *Microtus* and *Evotomys*. It was generally possible to distinguish their runways

from those of *Microtus* by their slightly smaller diameter and by their situation in moss rather than grass and weeds. In one place near the mouth of the Chulitna River they occupied a small boggy place which had become partially filled with decaying logs and dead branches overgrown with moss. Their runways perforated the entire mass in all directions, taking advantage of the situation at every possible point.

In our entire series of 24 specimens nearly all ages are represented, from young just out of the nest to very old, battle-scarred males. They show but little variation in color. Some of the slightly immature ones have a uniform brownish cast to the whole pelage, but the majority have the coloration so characteristic of all the species of the subgenus *Mictomys* and do not differ from specimens from other parts of Alaska. There is considerable variation in cranial characters, most of which is due to differences in age. These variations are particularly in respect to the shape of the nasals and the size of the audital bullæ, indicating that some of the characters supposed to distinguish *S. dalli* from *S. wrangeli* may not prove constant when good series of both are compared. The average measurements of 10 specimens, males and females, are as follows: Total length, 127; tail vertebræ, 19.2; hind foot, 18.7.

The natives of Lake Clark call the lemming mouse Kunjoónee, the same name also being used for the genus *Lemmus*.

***Lemmus minusculus* sp. nov.**

Type from Kakhtul River near its junction with the Malchatna River, Alaska. No. 119612 U. S. National Museum, Biological Survey Collection. ♂ ad. September 1, 1902. W. H. Osgood and A. G. Maddren. Original number 1903.

General characters.—Similar in general to *L. alascensis* but much smaller; color of anterior parts less contrasted with that of rest of body; skull slightly characterized.

Color.—Under parts and lower sides nearly clear ochraceous or tawny ochraceous; pervading color of upper parts also ochraceous but accompanied with considerable mixture of black and blackish, which is usually somewhat concentrated medially to form an indistinct line from the nose to the shoulders; rump patch hazel or light chestnut, less extensive and less contrasted than in *alascensis* and *trimucronatus*; ears dusky or occasionally with a few ochraceous hairs; base of whiskers dusky; feet seal brown; tail variable, sometimes dusky or blackish above and light buff below, and sometimes nearly uniform pale buff above and below.

Skull.—Similar to that of *alascensis* but very much smaller; zygomata less angular and bowed out; audital bullæ more nearly parallel, usually more inflated and less inclined to be compressed anteriorly; basioccipital and basisphenoid correspondingly slender; naso-frontal region decidedly elevated and rostrum depressed.

Measurements.—Average of 10 males from the type locality—total length, 131; tail vertebræ, 12; hind foot, 19; of 5 females—122, 12, 18.5. Skull: Greatest length, 28.5; basilar length of Hensel, 25.4; zygomatic width, 19; mastoid width, 15; nasals, 8.9; diastema, 8.8; postpalatal length, 12.2; upper molars, 8.

Remarks.—Lemmings were first met with at the upper forks of the Chulitna River, where two specimens were taken August 17. They were again found on the south fork of the river at the Swan Lake portage, and again on the Kakhtul River near its junction with the Malchatna, and on the Nushagak River near Kakwok. Signs of them were seen at various places between these points. They were found for the most part in the tundra-like openings in the forest in both moist and comparatively dry situations. The low, sloping banks of small ponds where there is particularly rank vegetation seem to be especially chosen by them. In these places their runways were found in labyrinths weaving through the moss and in and out among the roots of the shrubby plants, particularly those of the dwarf birch (*Betula glandulosa*). The runways were very well beaten and evidently much used. Many very small young were taken, but breeding was evidently about over. One pregnant female containing 4 embryos was taken on the Kakhtul River August 29, and another containing 6 on September 1. A series of 58 specimens was secured, representing various ages from very small young to adults. In color they show little variation, some few being more suffused with ochraceous than others. Many of the adults are in bright, fresh-looking pelage, but the hair is rather short and in some the pelage is quite worn. None of them approach *L. alascensis* in size, and the slight differences in color and cranial characters which distinguish them are quite constant.

Dicrostonyx nelsoni Merriam. Nelson Pied Lemming.

The catalogues of the National Museum record 4 specimens of this lemming collected by McKay at Nushagak. All were taken in mid-winter—one in 1881, two in 1882, and one in 1883. True, in recording them, quotes McKay's notes as follows: "Not very common. Found in the tundras, etc." Careful search for signs of these mice was without success. A few small burrows, possibly of *Dicrostonyx*, were found in some sandy banks near the lower end of Becharof Lake, but excavation proved them deserted.

Zapus hudsonius (Zimmermann). Hudson Bay Jumping Mouse.

Jumping mice occurred sparingly throughout the wooded region. They were also found beyond the limits of coniferous trees at Iliamna Bay and Cold Bay. Apparently favorable conditions for them exist in much of the tundra region, and it is possible that they may range a short distance into it. A badly mutilated specimen, killed by dogs, was seen at the head of Iliamna Bay; another, in similar condition, was

seen at Cold Bay by Maddren. Several were taken in the sedges about small ponds near Iliamna village, and in similar places along the Nogheling River, and near Keejik on Lake Clark. Others were secured near the head of the south branch of the Chulitna River, near Kakwok on the Nushagak River, and at Nushagak. In all cases they were taken in tall grass or sedge, in moist situations. They were seen, however, in several instances in the daytime in tall grass on comparatively high, dry ground.

Our specimens are much smaller than typical *Zapus h. alascensis* and plainly referable to true *hudsonius*. The hind foot in adults measures 31 mm., which is about the extreme in *hudsonius*, indicating a possible slight difference in size. The skulls are indistinguishable from those from Hudson Bay.

Two specimens of *Zapus* taken by McKay at Nushagak and recorded by True were the first jumping mice to be reported from Alaska.

The natives of Lake Clark call the jumping mouse Un-gúy-ah.

Erethizon epixanthus myops Merriam. Alaska Porcupine.

Alaska porcupines are found sparingly throughout the region. In a general way their range corresponds to that of the coniferous forest, but they have a great fondness for the aments and young leaves of the alder, which probably accounts for their occasional or possibly regular occurrence in the tundra region. Two skulls, secured by Maddren in 1903 from the Kanatak natives and said to have been taken near the head of Becharof Lake, attest the occurrence of the porcupine considerably beyond the conifers on the peninsula. We found them only along the Kakhtul River, where two specimens were taken. The natives of Lake Clark say that porcupines are quite common in that vicinity. An adult male taken on the Kakhtul River September 1 weighed 26 pounds. McKay's collection contained four specimens from Kakwok and Nushagak.

The native name for porcupine is Náinee. The Aleuts call them Ėsháluk.

Ochotona collaris (Nelson). Collared Pika.

Pikas were not found on any of the mountains visited, although conditions seemed to be favorable for them in nearly all cases. The Indian guide insisted that they were to be found on a small mountain which he called Keejik Mountain, near Keejik Village, on Lake Clark. As he described them fairly well and imitated their bark, it seems probable that they are there. Two specimens are in the National Museum, collected by McKay in the Chigmit Mountains, which, in this case, probably refers to the mountains northeast of Lake Iliamna. True, in his list of McKay's mammals, quotes from McKay's notebook in regard to these specimens as follows: "Said to be very plentiful in the mountains. The Indians in their vicinity have a superstitious dread about killing them, and can not be hired to do so."

Lepus othus Merriam. Alaskan Arctic Hare.

Arctic hares inhabit the treeless region around Bristol Bay and out on the Alaska Peninsula probably for its entire length. They occur very sparingly, however, and, although we spent considerable time within their range, we failed to see any or any fresh signs of them. During 1903, A. G. Maddren secured a small series of skulls from Cold Bay, Kanatak, and the Becharof Lake region. These agree in all important respects with topotypes of *othus* from St. Michael, and fail to show the narrow rostrum of *podromus* from the western part of the Alaska Peninsula. Two specimens taken by McKay at Nushagak are recorded by True.

The Aleut name for the Arctic hare is Ushkánuk.

Lepus americanus dalli Merriam. Dall Varying Hare.

Common throughout the timbered region. Hares were especially abundant about Lake Clark and along the Chulitna River, where their conspicuous runways were encountered nearly every time we went ashore. These runways are usually most numerous in low ground, not too wet, but thickly carpeted with moss, although this preference is not very decided. In following them one is led uphill and down, through moss, grass, or brush, across open flats or through dense forests, and over rocky knolls or through wet swamps where water often stands several inches deep in the runways themselves. In summer the hares feed largely on the tops of the dwarf birch which abounds. About Lake Clark we seldom saw a clump of it that had not been nipped. They also eat twigs of other small shrubs and occasionally try green grass stems, long cuttings of which we sometimes found in their runways. Specimens were easily secured, and a small series, chiefly from Lake Clark, was preserved. These are very similar to specimens of true *americanus* from Hudson Bay, and there is considerable variation among them, nearly sufficient to cover the characters of *dalli*. There is, however, a slight average difference.

Lynx canadensis (Kerr). Canada Lynx.

We saw no signs of the Canada Lynx, and were informed by the natives that it is of rather rare occurrence in the region.

The Kenai name for it is Káshznah; the Aleut is Etóchtoolik.

Canis albus (Sabine).^a Northern Wolf.

Wolf tracks were seen on a few of the beaches of Lake Clark and also about the portage from the Chulitna River to Swan Lake. We saw a skin of one that had been killed by prospectors in the winter of

^a Possibly the Alaska wolf is separable from other northern forms, but until this is determined the name *albus* Sabine, 1823, may be used. The only name prior to *albus* is *mexicanus* Linn., 1766, which unquestionably applies to another form. Say's name, *nubilus*, which is of even date with *albus*, may be disregarded on the same grounds.

1901 near the Malchatna River. Wolves are said to be common on the Alaska Peninsula, but we failed to see or hear them, or even to find their tracks.

***Vulpes alascensis* Merriam. Alaska Red Fox.**

Foxes are very abundant on the Alaska Peninsula, and fairly common in the adjacent regions to the northeast through which we traveled. Their tracks were frequently seen about Lake Clark and along the Chulitna River. On August 24, near Swan Lake, W. L. Fleming saw a bright-colored red fox running rapidly along a ridge. The following day, while crossing the portage, I surprised one that was calmly browsing on huckleberries on the side of a little gully. Later, members of the party saw foxes on several occasions on Becharof Lake and at Cold Bay, where several specimens were taken. During the winter of 1902-3 the natives of Kanatak trapped over 100 red foxes, chiefly about the head of Becharof Lake. Twelve perfect specimens were secured from them by Maddren, besides a splendid series of 50 skulls. A few skulls were obtained from natives at Kakwok and Ikhok on the Nushagak River. Fox tracks were seen in great numbers on all the sandy beaches about Becharof Lake. According to the natives they are to be found in similar numbers all along the peninsula. Specimens from Becharof Lake and Cold Bay are decidedly more richly colored than *V. fulvus*. The pervading color is deep hazel, except where diluted by creamy white; it is most concentrated on the middle of the shoulders and on the upper side of the tail. The face, nose, and forehead have considerable admixture of white hairs, but the predominating rufous effect is much deeper than in *V. fulvus*. The flesh measurements of two young adults from Cold Bay are as follows: Male—total length, 1,115; tail vertebræ, 440; hind foot, 188. Female—total length, 1,040; tail vertebræ, 375; hind foot, 175. The skulls of the Cold Bay specimens differ from the type only in having slightly more slender zygomata and longer and narrower nasals. In these respects they approach *abietorum*. The type, which is a male, agrees in size of teeth with females from Cold Bay, and is slightly smaller than the males from the same place.

McKay's collection contained "two very fine male specimens (13618, 13619) from Nushagak, captured on February 20 and 15, 1882, respectively." (True, Proc. U. S. Nat. Mus., IX, p. 221, 1886).

***Vulpes lagopus innuitus* Merriam. Continental Arctic Fox.**

Straggling individuals of the Arctic fox are not infrequently found as far south as the north shore of the Alaska Peninsula, doubtless having followed the pack ice in winter. One was killed by fishermen near Igagik in the spring of 1902. They are also said to be found in the Togiak district and very rarely at Nushagak.

Ursus americanus Pallas. Black Bear.

The Indians of Iliamna Village say that according to tradition a few black bears were formerly found in the mountains northeast from there, but that in recent years none have been seen. As far as we could learn they do not occur elsewhere in the region. Their westward limit on the Pacific side of the peninsula is about coincident with that of the coniferous trees, which cease a short distance east of Iliamna Bay. The westernmost records of the black bear known to the writer are those of two killed at Chinitna Bay in 1901 by the party of J. H. Kidder, of Boston, Mass.^a Two specimens of small cubs secured by McKay from the Kakwok Indians in 1882 were questionably referred to *Ursus americanus* by True. These may, however, have been the young of the large brown bear.

The Kenai Indians call the black bear Yerdeéshlah.

Ursus kidderi Merriam. Kidder Bear.**Ursus dalli gyas** Merriam. Peninsula Brown Bear.

Brown bears were formerly abundant in much of the country through which we passed, but the persistent hunting by the natives since the introduction of modern repeating rifles has reduced their numbers greatly. They still occur in many localities, but have become extremely shy and are seldom obtained unless a special campaign for them is conducted. In the course of our entire trip we saw remarkably few signs of bears. In fact, the only really fresh tracks seen were those of a medium-sized one which had been fishing along a small stream emptying into Lake Iliamna near the Nogheling portage. This region about Lake Iliamna was formerly a favorite hunting ground for the natives. Chief Michaluf, of the small remaining village known as Iliamna Village, enjoys the reputation of being the greatest bear hunter of his generation, having, according to local report, scores of bears to his credit. There are yet a good many bears in the vicinity of this big lake, and a few have been killed each season in recent years. Several old bear trails were found on the mountains near the head of Lake Clark. In following them we noticed a few 'bear trees' with the bark torn off and the trunks scored with claw marks. The highest scratches were found to be only 7 feet and 9 inches from the nearest place where a bear might stand, indicating that no very huge individuals had passed that way. In all cases the trees marked in this manner were white spruce. Considerable old 'sign' of bears was seen along the Kakhtul and Nushagak rivers, but the fishing season was over and the big fellows had presumably retired to the mountains, though no traces of them were found during the limited trips we made away from the water courses. We saw very

^aOuting Magazine, Jan., 1903, p. 474.

little 'sign' along the Ugaguk River and Becharof Lake. The natives say that this is not a good place for bears, though they are quite common about the Ugashik lakes near there.

The following notes on the habits of the brown bears of the Alaska Peninsula are largely such as have been derived from old native hunters. Most of the statements have been corroborated to a certain degree by independent discussion of the same subjects at different times with different individuals. As to the former great abundance of these bears there can be no doubt. The records of the fur traders do not fairly indicate this, for bearskins have usually been comparatively low priced and the natives have been urged to secure the smaller, more valuable, and more easily handled furs. Not more than fifteen years ago it was not uncommon to see from eight to fifteen bears scattered about on one mountain side. Those natives who have had an opportunity to see cattle feeding on the hills of Kodiak Island invariably compare them to the bears they saw in their younger days. Pioneer white men also say the same of the great abundance of the animal in the not very distant past. The season of activity of the bears varies, but is usually from the latter part of March or early April to the early part of November. They are not particularly averse to snow, and their tracks are often seen in it, but the date of their retirement in fall and of their reappearance in spring depends upon the severity of the season, so that sometimes they may go in as early as October and not come out until April. Sometimes, when disturbed, they come out for a short while in midwinter. Their dens are chosen in rocky, remote places in the mountains, to which they are sometimes tracked by the natives, both with and without the aid of dogs. The young are always born before the female comes out of her winter quarters. The date of birth is ordinarily sometime in January, doubtless varying considerably in individual cases, for during the summer cubs of different sizes may be seen on the same date. At birth the young are blind, naked, and helpless; they vary in number from one to four. Two is the usual number, three is not very uncommon, while four is quite rare. They follow the mother until the end of their second summer, when they are often nearly as large as she is.

Although numbers of the adults frequent some localities, it is generally safe to assume that three or four bears found together constitute one family. The cubs are mischievous and playful and receive many a stern reproving cuff from their mother. The brown bears avail themselves of everything the country affords in the way of food, including fish, flesh, fruit, roots, and grass, a variety that was scarcely exceeded by the natives when under aboriginal conditions. When they first come out in the spring, they eat young grass, herbage, and roots, and if they are near the coast, take a little kelp. In securing and handling these as well as their other food they display much

deftness and a control of their foreclaws seldom accredited to their kind. In the spring they also enjoy, now and then, a meal on a ground squirrel (*Citellus*). Hunting these squirrels and digging them out seems to be a combination of business and pleasure for the bears, and the antics they go through are very interesting to the onlooker. The bear is usually so intent on the game that he himself is easily approached. Sometimes he slips along a hillside and tries to catch the squirrel by a sudden pounce, but this usually fails. When the squirrel dodges into its near-by burrow, new tactics are adopted. The bear immediately begins to dig, throwing out big turfs and clods at each stroke, using the left hand chiefly and watching the hole intently all the time. While this is going on, the squirrel sometimes runs out between the legs of the bear and makes for another hole. Possibly he is caught by a quick pounce. If he escapes, excavations begin immediately at the new hole. The bear digs for a few strokes, and then stops to poke his nose into the hole and sniff. Finally his efforts are successful and the luckless squirrel is devoured.

As soon as the salmon begin to enter the streams, bruin makes fishing his chief business. He varies his diet somewhat, however, and occasionally leaves the streams for the mountain sides, but in a short time returns again to the fish. The fish in large numbers usually ascend the streams for the entire summer, and the supply is practically unlimited. In fishing the bears do not get all their prey in shallow water or on bars and riffles in small streams, as is generally supposed, but often go into comparatively deep water in large streams. Practically all the fishing is done at night or very early in the morning; though their habits in this respect have doubtless changed in recent decades, since they have been hunted so much. It is most interesting to watch an old she bear with cubs. The cubs do not attempt to fish, but stay on the bank and receive contributions. The old she bear stands upright and wades in water even up to her neck, going very slowly with the current, watching the water and scarcely making a ripple in it. She holds her arms down at her sides with her hands spread, and when she feels a salmon coming up against her, clutches it with her claws and throws it out on the bank to the expectant cubs. Often she stands perfectly motionless for a considerable time, and when she moves, it is with extreme deliberation and caution. After supplying the cubs she puts the next fish in her mouth and goes ashore to eat it. If salmon are plentiful or easily obtained, the two sides of a fish are all that she will eat; sometimes she even scorns these and fastidiously crunches the head and leaves the rest. The gills are never eaten. The cubs are not so particular, but chew their portions haphazard. In case they have any difficulties among themselves in apportioning the tidbits, they are promptly cuffed by the parent.

When fishing in shallow water, the bear walks slowly on all fours as

silently as possible, and when a fish appears in a riffle deals it a sharp blow on the head. During the fishing season the bears make deep trails in the grass along the bank, where at short intervals bones and other remnants of salmon in large quantities testify to bruin's ability as a piscatorial sportsman. Occasionally by following some of the branches of these trails one may discover the midday resting place of the nocturnal fishers. One that I saw on the Kakhtul River was an ideal retreat. A soft bed was made in the grass and moss under the thick shelving branches of a small spruce. Around this small alders and willows formed a sort of inclosure which opened on one side and gave an outlook upon the river. The whole place had an air of coziness which would appeal to anyone accustomed to selecting camping sites. In the fall, toward the end of the salmon run, when fishing becomes unprofitable, most of the bears retire to the hills, where they feed on berries and put on fat during the last few weeks preceding hibernation. The black crowberry (*Empetrum nigrum*) is eaten in great quantities, and various species of *Vaccinium* which abound are also taken. In moving up and down the mountains the bears usually follow the ridges, as shown by their trails, which often indicate years of use. These old trails do not resemble ordinary game trails, which are merely paths, but each consists of a succession of distinct, irregularly oblong indentations in the turf, alternating from side to side, a sort of composite of the prints that have been made by many feet during many seasons. These depressions become nearly 18 inches in length by 10 inches in width and from two to four inches in depth. They are often quite conspicuous and can be seen for a considerable distance.

The two types of coloration commonly shown by these species of bears, the dark brown and the light brown or even creamy, do not seem to be anything more than color phases or individual variations. I have examined numbers of skins, and, in all lots exceeding a half dozen, both phases, or modifications of both, were represented. Moreover, the natives tell me that they have often seen a light and a dark cub following the same mother. A certain amount of this difference in color among the adults may be seasonal, but it does not seem probable that it is entirely so, for skins of both general types are frequently seen in the same apparent condition, and are alleged to have been secured at the same season.

The geographic distribution of the various forms of the Alaska brown bears is still imperfectly known. Even the range of the group as a whole is not thoroughly understood owing to the impossibility of distinguishing them from grizzlies in reports which come from localities not represented by specimens. *U. dalli gyas* extends westward at least from Cook Inlet to and including Unimak Island; large bears are found also on Nunivak Island and on the coast of Bering Sea from Bristol Bay northward, and probably range over much of the north-

ern and western part of Alaska. To what extent the group ranges into the interior of the Territory is not known, and specimens with good skulls and reliable data from any point in the interior are greatly desired.

***Lutra canadensis* (Schreber). Land Otter.**

Land otters were formerly quite common on the Iliamna River, and a few are still obtained there every year. They are also found along the shores of Iliamna Lake and on some of the small islands in the lake, as well as on Lake Clark. Considerable 'sign' of otters was seen on the Swan River, and one evening three of the animals were startled from the bank as we were floating downstream near the junction of the Swan and the Kakhtul. On sighting the canoe they plunged into the water and swam frantically downstream at about 10 yards from the shore, evidently making for refuge in holes in the bank. We were on the other side of the river and crossed the current with some difficulty, being so much interested in watching the evolutions of the otters that we did not get within shotgun range of them until they hauled out on the bank about 100 yards below the point from which they started. A charge of buckshot was fired at the last one as he was leaving the water, but, though wounded, he managed to escape. The animals swam with great rapidity, proceeding by a succession of leaps and dives and coming clear out of the water like porpoises.

Otters are quite common in the vicinity of Becharof Lake, and are said to be found in considerable numbers all along the Alaska Peninsula. Their trails were frequently found along small streams emptying into the lake, and generally ran through tall grass, up and down and along the banks. Several skins taken in the vicinity of the lake were brought in October by natives to be traded at Cold Bay. An immature specimen from the Nushagak River was contained in McKay's collection as recorded by True. One complete specimen and several skulls from Becharof Lake were secured in 1903 by Maddren.

The Aleut name for the land otter is Ah'kwééah; the Kenai Indian is Chweeneélingoch.

***Lutreola vison melampeplus* Elliot. Kenai Mink.**

In spite of continued trapping by natives for furs, the mink is still fairly common in much of the region of the base of the Alaska Peninsula. It is said to be found in small numbers along the Iliamna River. More or less 'sign' of it was found along the Nogheling, Chulitna, Kakhtul, Nushagak, and Ugaguk rivers, but usually at such times and under such circumstances that any attempt to secure specimens was impossible. Tracks were frequently seen in soft mud along the narrow course of the south branch of the Chulitna. While gliding down the stream one dark night with a native in a bidarka, I startled a mink at a sudden bend in the stream. It did not perceive us until

we, also unaware, were within a few feet, and then, instead of diving as might have been expected, it dashed up the bank and away through the long grass and low bushes, making a great commotion. Two specimens were secured near the head of Becharof Lake and three at Cold Bay, and several odd skulls were obtained from natives on the Kakhtul and Nushagak rivers. These, on account of their large size and very dark color, and particularly on account of the absence of any white pectoral spot, are provisionally referred to *L. v. melampeplus* Elliot,^a although they have not been compared with specimens from the Kenai Peninsula, the type locality of *melampeplus*. The five skins from Becharof Lake and Cold Bay are all characterized by uniform dark underparts without the usual white pectoral patch.^b The measurements of the largest male are as follows: Total length, 660; tail vertebræ, 220; hind foot, 73. Other males, respectively: 647, 215, 70; 651, 212, 70. Females: 563, 189, 61; 557, 190, 63. Weights: Male, 3 pounds; female, 1 $\frac{3}{4}$ pounds.

At Iliamna Village the mink is called in Aleut Émachamööduk; in Kenai Yarkeéchah; at Igagik it is Kō'chcheechuk.

Putorius arcticus Merriam. Arctic Weasel.

One weasel was secured at Nushagak and another near the head of Becharof Lake; several others were added to the collection in 1903 by A. G. Maddren. Six specimens were taken in 1881 by McKay at Ugashik.

The Indians of Iliamna Village call the weasel Tahkiák and Kahoól-cheenah; the Aleuts call it Ameetáhdruk.

Mustela americana Turton. Marten.

Evidently quite rare, as we heard very little of it from the natives. This might naturally be expected, as it is a forest-loving animal, and the region under consideration is on the edge of its range. The natives of Iliamna call it Kcheegóchah.

Gulo luscus (Linnæus). Wolverine.

Wolverines are found sparingly throughout the region, being rather common on the Alaska Peninsula. A few skins were seen in the trader's store at Nushagak. The traders take advantage of the natives'

^a Field Columbian Mus., Zool. Ser., III, pp. 170-171, April, 1903.

^b Since this was written a series of eight skins and a large number of skulls from Becharof Lake have been received from A. G. Maddren. These show the same dark color, four of them being without trace of white and the other four with only very tiny spots on chin and breast. Specimens without white are very rare in *L. v. energumenos*, which usually has an extensive pectoral patch. A single specimen from Tyonek, Cook Inlet, was previously referred to *energumenos* (North Am. Fauna, No. 21, p. 69, September, 1901), its dark brown immaculate underparts being regarded as due to individual variation. With a series of fourteen specimens, in all of which the white markings are nearly or entirely obsolete, it now seems evident that a recognizable subspecies occurs in the Cook Inlet and Alaska Peninsula region.

peculiar fondness for the coarse fur of the wolverine as trimming for their garments, and never ship the skins out of the country, but resell them to the natives at high prices. A single skin obtained from a native in urgent need of provisions, for from \$2 to \$5 in trade, is sometimes cut up into sections and bartered piecemeal for other furs to the value of as much as \$30.

The Aleut name used for the wolverine at Iliamna Village is Drāk-ūnyuk; at Igagik it is Mächāwhā'luc; the Lake Clark Indians call it Brūsháh.

Latax lutris (Linnæus). Sea Otter.

The coast of the Alaska Peninsula from Iliamna Bay westward was formerly much frequented by sea otters. Kamishak Bay was a favorite hunting ground for the natives of Iliamna Village and others. Even within the last five years parties have hunted otters there with considerable success. A sea otter is occasionally secured by hunting from shore in calm weather, when the animal may come in near enough to be shot. The hunter stations himself on a high lookout, usually a rocky bluff, and carefully watches the water. If an otter is seen within rifle shot, and a lucky shot is made, the chances are good that the prize will be secured. One was taken in this manner in December, 1902, at Wide Bay, and another the preceding winter near Cold Bay. One skull secured by Maddren from a Kanatak native is in our collection.

The Aleut name for the sea otter is Ah'chgh-nahchgh.

Erignathus barbatus nauticus (Pallas). Western Bearded Seal.

Phoca nautica Pallas, Zoog. Rosso-Asiat., I, pp. 108-109, 1811.

A young bearded seal was killed by natives near our camp on the Ugaguk River October 3. I offered a variety of articles in exchange for its skin, but all were scornfully rejected. The skull, however, was secured for a trifle. The natives prize the skin very highly on account of its great utility as material for making the soles of their skin boots. It was also used formerly for making kyaks and bidarkas, but on account of its scarcity its use has now become restricted almost entirely to the making of boot soles. The flesh and blubber of this seal are also much in favor with the natives. Their name for the animal is Makluk, very similar to "mukluk," which is what their skin boots are called.

On comparing the skull from the Ugaguk River with others from Greenland and the eastern coast of North America several slight differences were noticed. These cranial characters are constant in the small series from each side of the continent which I have been able to examine, and I have therefore adopted the name *Phoca nautica* of Pallas for the bearded seal of the northern coasts of Alaska and Siberia. Several skulls from Plover Bay, Siberia, agree with those from the

Alaska coast, which confirms the belief that the Bering Sea form is a general entity as contrasted with the form of the northeastern Atlantic coasts. The most obvious and constant character of the skulls from Bering Sea is the shortness of the nasals. They are shorter and wider than in typical *barbatus*, and correspond to a general brachycephalic condition of all parts of the skull. The brain case is wider and fuller; the rostral portion of the skull anterior to the infra-orbital foramina is heavier and thicker, and the palate, basisphenoid, and basioccipital are wider. Another possible character is shown in the lack of a decided space between the last two upper molars. In the skulls which I have seen, this space is very pronounced in typical *barbatus* and almost or totally lacking in *nauticus*.

***Phoca richardi* Gray. Pacific Harbor Seal.**

The skulls of seven harbor seals taken by natives along the Alaska Peninsula between Kanatak and Katmai were secured in the fall of 1903 by A. G. Maddren. The adults of these agree essentially with skulls from the Pribilof Islands, and in case the subspecies *pribilofensis* proves entitled to recognition they should be referred to it.^a Among the immature ones are several, strictly comparable, which do not differ from the only available skulls of true *richardi* from Puget Sound.

^a Doctor Allen's recent separation of the northern hair seals under the name *pribilofensis* may fairly be called provisional, since the available material was admittedly a rather meager basis for such separation. (Cf. Bull. Am. Mus. Nat. Hist., XVI, p. 495, Dec. 12, 1902.) While admitting the probability that the seals of Bering Sea may differ subspecifically from those of Puget Sound, I am unable to appreciate any characters whatever after an examination of all the material now available. Even if the alleged characters should prove real and constant, there still might be some question as to the advisability of recognizing three forms on the Pacific coast, for it would be a case of two extremes (*geronimensis* and *pribilofensis*) and an intermediate (*richardi*). The differences between the extremes being only of size, and these not very marked, there would scarcely seem to be room for more than two definable forms.

In the light of Doctor Allen's careful study of the seals of the North Pacific, it is evident that the name *Phoca largha* can no longer be used for the hair seals of the Alaskan coast. The summary disposition of the name altogether as entirely unidentifiable is surprising, however. Like many other names (possibly the majority) proposed by early authors, this one applies equally well to several species. It is restricted to a reasonably definite locality, and is not composite in the ordinary sense of the term, but merely insufficiently diagnosed, as judged by recently established standards. Therefore, to be consistent, it should be restricted to one of the forms to which it unquestionably applies, as has been done in many similar cases. Its rejection at the present time is largely a matter of accident, for if we suppose a different history of the knowledge of the animals, there would now be no question as to the use of the name. That is, if specimens of only one of the three spotted seals of Kamchatka had come into the hands of a modern naturalist, instead of all three at the same time, the name *largha* would have been applied to it without question, and the subsequent discovery of the other two could not have affected its status in the least.

A spotted seal is reported as a permanent resident of the fresh waters of Lake Iliamna. While in this vicinity we made efforts to secure specimens of this seal from the natives, and Maddren tried again in 1903, but none were obtained. All reports are to the effect that it differs from the ordinary harbor seal, but the only character mentioned by the natives is size, some stating that it is larger and others that it is smaller than the salt-water form. Most of those killed are said to have been found in the Kvichak River or in the lake near the outlet into the river, which seems to indicate that the animals, whether distinct or not, go back and forth from Bristol Bay to Lake Iliamna.

The Aleut name for the seal is Ishoóik.

Odobenus obesus (Illiger). Pacific Walrus.

A very limited number of walruses still occur about some of the small islands in Togiak Bay west of Nushagak, and on the north coast of the Alaska Peninsula in the vicinity of the native village of Unangashik. Large quantities of walrus bones, witnesses of bygone slaughters, are to be found at various points along the peninsula. One such place was reported by the fishermen of Igigik, who had recently found it while on a hunting trip near there. From their accounts, the remains must be in great quantities. The trader at Nushagak informed me that in recent years he had obtained annually from 9 to 15 walrus tusks from the Togiak region. He intimated that the natives had given him to understand that they would not be able to get many more. A sailor from Nushagak visited Unangashik in August and September, 1902, and while there saw five walruses. They haul out on a sand spit near this place, but seldom get far from the water. Clams, which they feed on, are abundant there. The same man stated that he was at Unangashik with a trophy hunter in the previous year, at which time they secured several of the ponderous animals. They also visited Togiak Bay, but found no walrus.

Sorex personatus arcticus Merriam. Arctic Shrew.

Shrews of the *personatus* type were found sparingly all along the route, being most common in the coast region. The entire series collected numbers 44 specimens. In color they are not definitely distinguishable from true *personatus* of the eastern United States, but after comparing them with series of true *personatus* I am inclined to refer them to *arcticus* on the basis of cranial characters. In the Alaskan specimens the skull is characterized by small size and general slenderness; by a narrow and rather high braincase; and by having the palatamaxillary region between the upper unicuspid rather abruptly narrowed. Specimens from Cook inlet, previously referred

to *personatus*,^a possibly represent a slight tendency toward the large dark form *streatori*, although they are very much nearer to *arcticus* and *personatus*.^b

Sorex obscurus shumaginensis (Merriam). Shumagin Shrew.

Sorex alascensis shumaginensis Merriam, Proc. Wash. Acad. Sci., II, p. 18, Mar. 14, 1900.

This shrew was not found about Lakes Iliamna and Clark, but several specimens were taken on the Kakhtul River near its junction with the Malchatna. From that point on to Nushagak it was found in considerable numbers. It was also taken on the Ugaguk River, Becharof Lake, and at Kanatak and Cold Bay. It is found about the houses in the village of Nushagak in company with *Microtus* and *Evotomys*. Specimens taken early in October were beginning to acquire the dark plumbeous winter pelage, and by the middle of the month the change had been completed in the majority of cases. In the brown pelage preceding this, the color is the same as that of *shumaginensis* from the type locality, and somewhat paler than in *alascensis*. The skulls are practically identical with those of *shumaginensis* and smaller than those of *alascensis*. On comparing the Nushagak series and others from the same vicinity with typical *obscurus* from the United States, a surprising resemblance is found; in fact, some specimens of each, although of slightly different dimensions, are almost indistinguishable either by color or by cranial characters, which increases the probability that the two forms have a continuous range by way of the interior of Alaska and northwestern Canada.

Sorex (Microsorex) eximius Osgood. Northern Microsorex.

One specimen of this rare shrew, an adult female, was taken by A. G. Maddren on the south branch of the Chulitna River near the portage to Swan Lake. Its skull is not quite so elongate as that of the type specimen, but otherwise agrees with it.

Myotis lucifugus (Le Conte). Little Brown Bat.

Several bats were seen in July at Iliamna Village and near the head of Lake Clark, but no specimens were taken. At this season they do not fly until quite late in the evening, sometimes not until 11 o'clock and later. Even if one denies himself sleep until this hour and is then able to shoot them, the chances of retrieving them are slight on account of the dense vegetation into which they usually fall. One specimen is recorded by True as secured by McKay in the spring of 1882 on Lake Iliamna.

^a Cf. N. Am. Fauna No. 21, p. 70, 1901.

^b Doctor Allen's recent reference of Cook inlet specimens to *streatori* is difficult to understand in the face of the measurements he publishes, which are decidedly smaller than those of *streatori*. In referring specimens to *S. alascensis* he is equally inexplicable, since he states that they differ from true *alascensis* in precisely the characters which distinguish *shumaginensis* from *alascensis*. Cf. Bull. Am. Mus. Nat. Hist., N. Y., XVI, pp. 228-230, July, 1902.

LIST OF BIRDS.

Colymbus holboëlli (Reinh.). Holboëll Grebe.

A fine adult male of this species was taken at Nushagak by McKay, October 12, 1881, and the specimen is now in the National Museum. Another is recorded as taken at Point Constantine, Bristol Bay, May 30, 1882.

Colymbus auritus Linn. Horned Grebe.

Several small grebes, assumed to be this species, were seen at the upper end of Becharof Lake October 6-7. McKay took a specimen at Nushagak June 21, 1881.

Gavia adamsi (Gray). Yellow-billed Loon.

A large loon, either this species or *G. imber*, was killed and eaten by natives at Cold Bay October 17. This was the only large loon seen by us. An immature specimen is in the National Museum, collected at Igushik, across the river from Nushagak, September 21, 1882.

Gavia pacifica (Lawr.). Pacific Loon.

This was the most common loon on the lakes and rivers. It was found on the Nogheling River, the Chulitna, the Swan, Kakhtul, and Nushagak, as well as about many small ponds a short distance back from the rivers. It was exceedingly abundant along the Chulitna River, where from 8 to 15 individuals were seen almost daily. These were generally seen going up and down the river, flying singly or more often in pairs, about 100 yards above the water and religiously following the course of the stream. They were quite wary and we seldom approached one on the water nearer than 150 yards, even when we were slipping noiselessly downstream. The adult birds, sitting on the water at a little distance, appear as if their heads were entirely white, particularly if a ray of sunlight bears on them. The rapidity with which they swim under water is amazing, as we repeatedly observed when one would dive at a point about 150 yards in front of our canoe and in a few moments appear at about the same distance astern. Being unable to carry such large birds we preserved no specimens. Specimens were taken by McKay and Johnson at Nushagak, Cape Constantine, and Ugashik.

Gavia lumme (Gunn.). Red-throated Loon.

A pair flew by camp on the Chulitna River on the evening of August 12, and a few others were seen at comparatively long inter-

vals along this river and the Kakhtul. They were far exceeded in numbers by the Pacific loon. Specimens were taken at Nushagak by McKay.

Lunda cirrhata Pall. Tufted Puffin.

Four tufted puffins were taken by J. W. Johnson at Nushagak May 9, 1885. The species was not seen by our party.

Fratercula corniculata (Naum.). Horned Puffin.

The catalogue of the U. S. National Museum records three specimens of the horned puffin taken at Nushagak by J. W. Johnson May 9, 1885. I have been unable to find them.

Cyclorhynchus psittaculus (Pall.). Paroquet Auklet.

A paroquet auklet (No. 106604, U. S. N. M.) was taken near Nushagak by J. W. Johnson May 22, 1885.

Simorhynchus cristatellus (Pall.). Crested Auklet.

Two specimens were taken at Nushagak by J. W. Johnson, April 22, 1885. One was taken by McKay at Nushagak and one at Ugashik.

Brachyramphus marmoratus (Gmel.). Marbled Murrelet.

Several murrelets (apparently this species) were seen on Kanatak Bay, October 13. A single immature specimen (No. 106605 U. S. N. M.) was taken near Nushagak by J. W. Johnson, September 5, 1885.

Brachyramphus brevirostris Vigors. Kittlitz Murrelet.

Three specimens of this rare murrelet were taken by C. L. McKay at Point Etolin, near Nushagak, April 3, 1883.

Cephus columba Pall. Pigeon Guillemot.

Five specimens were taken near Nushagak by J. W. Johnson, May 20-22, 1885.

Uria troile californica (Bryant). California Murre.

Five specimens were taken near Nushagak by J. W. Johnson, April 20-22, 1884. No murrees were seen in this region by our party in September and October.

Stercorarius parasiticus (Linn.). Parasitic Jaeger.

One specimen of the parasitic jaeger in the dark phase was taken by McKay on the Ugashik River, July 28, 1881. The species was not seen by our party.

Stercorarius longicaudus Vieill. Long-tailed Jaeger.

A single long-tailed jaeger was seen among a few gulls on Lake Iliamna, July 16. Specimens were taken by McKay at Nushagak and Ugashik in July and August, 1881.

***Rissa tridactyla pollicaris* Ridgw. Pacific Kittiwake.**

A few kittiwakes were noticed among the numerous gulls at Nushagak September 12-26. Two specimens were taken at Ugashik by McKay September 11, 1881.

***Larus glaucescens* Naum. Glaucous-winged Gull.**

A large gull occasionally flew over camp at Iliamna village, and numbers were seen on Lake Iliamna July 16-17. Gorman reports them in very large numbers at the lower Nogheling rapids, where natives were catching large quantities of salmon in August. They are said to breed on many of the islands in Lake Iliamna. They were very rarely seen on Lake Clark, and none were found along the Chulitna River. A solitary gull appeared at intervals near Swan Lake, and scattering individuals were seen from there on down to the mouth of the Tikchik River. From the mouth of the Tikchik they were in immense numbers—thousands without doubt. At the time we passed down, the salmon run was practically ended, but it had been a very large one and the banks of the river were strewn with dead fish, upon which the gulls were regaling themselves royally. During the few days we were passing down this stretch of the river, hundreds of cackling, screaming gulls were overhead from morning till night. As soon as one flock tired of following, another white cloud would rise from its resting place on one of the long, smooth sand bars and accompany the party until thoroughly satisfied as to its character. Apparently one species monopolized the salmon business, for I saw none that I did not take to be *glaucescens*. Some were so fat that they seemed to fly with difficulty, and many showed a prominent abdomen and general corpulency quite unlike the usual trim appearance of their kind. They were abundant on the mud flats and about the salmon canneries at Nushagak, but there they were mixed with other species. Many were also seen at Igigik and on Becharof Lake, where they are said to breed in some numbers. About the lake they appeared only in scattering numbers except at the mouths of the small salmon streams, where they fairly swarmed. They were also seen at Kanatak and Cold Bay, where they often afforded us amusement by their maneuvers against the high winds that were prevailing while we were there. One specimen was taken at Nushagak by McKay, but at present I am unable to find it in the National Museum.

***Larus brachyrhynchus* Rich. Short-billed Gull.**

A small gull, supposed to be this species, was seen on Lake Iliamna near the Nogheling portage July 17. The species was not seen again until we reached a point on the Nushagak River about 25 miles above Nushagak, where it became common. It was quite abundant at

Nushagak, probably outnumbering all other gulls. A few were seen at Igagik and from there to Kanatak and Cold Bay. Specimens were taken at Nushagak by McKay.

Larus philadelphia (Ord). Bonaparte Gull.

A pair of these beautiful gulls in full plumage was seen hovering solicitously about a sandy beach on Lake Iliamna July 16. A short search failed to disclose the nest, which was evidently located in the vicinity. The species was not met with elsewhere. Specimens were taken by McKay and Johnson at Nushagak, Lake Aleknagik, and Ugashik.

Xema sabinei (Sab.). Sabine Gull.

A single specimen of the Sabine gull was taken by C. L. McKay at Lake Aleknagik September 2, 1881.

Sterna paradisæa Brünn. Arctic Tern.

A few were seen on July 16 on Lake Iliamna, where they doubtless breed on some of the numerous islets. None were seen after this date by our party. Specimens were taken near Nushagak in May and June by McKay and Johnson.

Diomedea albatrus Pall. Short-tailed Albatross.

Two specimens were taken by McKay on Bristol Bay near the mouth of the Ugashik River July 20, 1881. The species was not seen by us except in the north Pacific.

Puffinus tenuirostris (Temm.). Slender-billed Shearwater.

The National Museum catalogue records one specimen of this bird taken near Ugashik by McKay September 15, 1881. The entry does not seem open to question and is probably correct, though the specimen is not now at hand to substantiate it.

Oceanodroma furcata (Gmel.). Fork-tailed Petrel.

Several specimens were taken at Nushagak by Johnson and at Igushik and Ugashik by McKay.

Oceanodroma leucorhoa (Vieill.). Leach Petrel.

One specimen of the common petrel was taken at Ugashik by McKay December 3, 1881.

Phalacrocorax dilophus cincinatus (Brandt). White-crested Cormorant.

Cormorants occasionally flew over our camp at Iliamna Village while on the way to and from their nesting places on some of the islets in Lake Iliamna. On July 16 we passed several small rookeries, where the birds could be seen in considerable numbers coming and going or standing in groups on the rocks near the water's edge. Several were seen flying up and down the Noghelung River July 21, doubtless following their usual highway between the two large lakes. One

specimen was taken by Maddren on Lake Clark August 2, and a few others were seen about the upper end of the lake, but evidently very few, if any, breed there. After leaving Lake Clark no more cormorants were seen until we reached the Malchatna River a short distance above the mouth of the Tikchik, when this species again appeared and was seen daily thence to Nushagak, but not in great numbers. Several were seen on Becharof Lake October 4 to 7.

Phalacrocorax pelagicus Pall. Pelagic Cormorant.

The pelagic cormorant was not seen on the lakes and was found only in rather small numbers in the lower Nushagak River, on Bristol Bay, and on Becharof Lake. Specimens were taken at Cape Constantine and Ugashik by McKay, and at Nushagak by Johnson.

Merganser americanus (Cass.). American Merganser.

The National Museum catalogue records one specimen of the American merganser taken by McKay on the Nushagak River, October 15, 1881. With the exception of one adult male among a number of ducks killed by natives on Becharof Lake, I think none of the mergansers seen were referable to this species, all others being *M. serrator*.

Merganser serrator (Linn.). Red-breasted Merganser.

Exceedingly abundant on all the lakes and rivers visited by us. Camp had barely been pitched on the banks of the Iliamna River, near Iliamna village, July 12, when an old female merganser with a flock of 11 young came sailing down the current of the river. During the two following days this family party was seen every few hours. When alarmed, the old bird dove or flew, and the little fellows flapped their tiny down-covered wings and paddled frantically with their little feet, streaking over the water upstream against a strong current, at an almost incredible speed. Many such families of young of various ages were seen along the Chulitna, Kakhtul, and Nushagak rivers. Whenever we approached near enough to alarm them, this performance was repeated, their frantic efforts to get out of harm's way being often quite ludicrous. Flocks of 8 to 15 young adults were frequently seen on the lower Nushagak, and scarce a half hour passed while we were traveling on the rivers that one or more individuals were not in sight. From start to finish probably more mergansers were seen than any other species of water bird, with the exception of the large gulls. Two downy young were taken at Iliamna village, and adults were killed, but not preserved, on the Nushagak River. McKay took specimens at Nushagak and Lake Aleknagik.

Anas boschas Linn. Mallard.

An old female of this species in very poor flesh was shot in a grassy overflow swamp at the mouth of a small stream near the head of Lake Clark; two others in similar condition, with no primaries except short

pinfeathers, were taken at the mouth of the Chulitna River August 4. No others were seen in this vicinity, but their familiar quack was heard frequently as migrating flocks flew over on the nights of August 7, 8, and 9. In spite of this scarcity of mallards on the Chulitna side and indication that they were moving south, they began to appear later on Swan River. Thence to the end of our route they were more or less abundant, probably outnumbering all other fresh-water ducks. On Swan River, nearly every turn of the stream or little bight, where slack water gave opportunity for a growth of grasses and water weeds, harbored at least a pair of mallards, and often a small flock. From the junction of the Swan and the Kakhtul rivers to the mouth of the Tikchik very few were seen, as the banks are unfavorable and covered with spruce timber; but from the mouth of the Tikchik down the Nushagak to its mouth they were very abundant September 3 to 12. Here they were found on the open, barren sandbars or in shallow coves near them where the pebbly bottom afforded but little growth of vegetation, so that it scarcely seemed possible that they were feeding. They were found in such places, however, at all times of the day, from the first streaks of dawn until it was quite dark. Others were found along the numerous sluggish branches of the river in more favorable feeding places; but by far the greater number were out on the main river, among the thousands of gulls, geese, and cranes, along the stretches of sand. One foggy morning, as we were slipping down the current of one of the narrow side channels, a brace of mallards flew across a small peninsula to our left and alighted in a little cove, whence they hauled out on the muddy bank. Thinking to secure a good fat duck for dinner, we quickly swung the canoe into an eddy and paddled upstream toward the little cove. One of the birds flew while out of range, and at about the same time the other somehow disappeared, although there was but a small patch of grass for concealment. Expecting the bird to rise at any moment, we paddled on but were beginning to feel baffled, when just before the canoe touched the bank, we found our game giving a very pretty exhibition of its confidence in protective coloration. It was a female mallard, and lay on the brown mud bank, strewn with dead grass and decaying matter, which blended perfectly with the markings of its back. It was not merely crouching, but lay prostrated to the last degree, its wings closely folded, its neck stretched straight out in front of it with throat and under mandible laid out straight, and even its short tail pressed flatly into the mud. The only sign of life came from its bright little eyes, which nervously looked at us in a half hopeful, half desperate manner. When a paddle was lifted, with which it could almost be reached, the bird started up and was allowed to escape with its well-earned life.

Mallards were seen in large flocks at Nushagak September 16 to 26; a few flocks were also seen about Becharof Lake, and one was killed at the head of the lake as late as October 16. High-flying flocks of ducks, apparently mallards, were seen at Cold Bay October 20. McKay found the species breeding at Nushagak and took a number of specimens there in May and June, 1881.

***Mareca americana* (Gmel.).** Baldpate.

Several specimens were taken by McKay at Cape Constantine and at Ugashik September, 1881. The species was not seen by us.

***Nettion carolinense* (Gmel.).** Green-winged Teal.

Green-winged teal were very scarce on the interior lakes and rivers. One old female was seen on the Nogheling River July 21, and no more appeared until we neared the coast on the lower Nushagak River. Immense flocks were seen in late September in the vicinity of Nushagak. McKay obtained several specimens at Nushagak and at Ugashik.

***Spatula clypeata* (Linn.).** Shoveller.

One specimen was taken near Nushagak by McKay August 14, 1881, and another September 24, 1882. The species was not seen by our party.

***Dafila acuta* (Linn.).** Pintail.

No pintails were seen by us among the large flocks of other ducks met along the Nushagak River. Numerous specimens were taken from June to August at Nushagak by McKay and Johnson.

***Aythya marila* (Linn.).** Scaup Duck.

Scaup ducks, doubtless this species, were seen in small flocks along the Nushagak River September 4 to 9. McKay took them in May and July at Nushagak and Ugashik.

***Clangula islandica* (Gmel.).** Barrow Golden-eye.

One was seen on the Nogheling River July 20, and one was killed there some days later; another was shot by W. L. Fleming on a small pond near the head of Lake Clark July 28. Several immature birds were killed at the mouth of the Chulitna River August 4. Rather common at intervals along the Chulitna River August 12 to 17; generally seen in family parties of 6 to 10. Near Swan Lake a flock of about 15 was seen feeding on a shallow lake in company with a flock of 10 swans. Seen almost daily in pairs or small flocks along the Malchatna and upper Nushagak September 3 to 6.

***Charitonetta albeola* (Linn.).** Buffle-head.

Two specimens were seen at Cold Bay October 17 among some ducks killed on the bay by natives. One was taken at Nushagak by McKay May 2, 1882.

Harelda hyemalis (Linn.). Old-squaw.

A few old-squaws were seen on the Nushagak River, about 25 miles above its mouth, September 11. Others were seen in small flocks from this point to Nushagak, and they were also common on Bristol Bay, between Cape Etolin and Igagik. Several parties of them were seen on the lower Ugaguk River September 29. Most of these were immature birds. Those that were killed were found to be very good eating, though of a decidedly different character from mallards, which were sometimes baked in the same pan.

Histrionicus histrionicus (Linn.). Harlequin Duck.

Seen in small flocks along the Ugaguk River and in and about the mouths of the larger streams that empty into Becharof Lake; common on salt water at Kanatak and Cold Bay. They spend much time out on the open water with other species of ducks, but frequently leave their company to visit the mouths of small streams or to ascend them for considerable distances. When slightly startled on a stream they do not fly, but keep at a safe distance from danger by allowing the current to carry them downstream, unconcernedly passing through riffles and rapids, and deftly avoiding, without apparent effort, the rocks and whirlpools.

Among the considerable number that we killed, none were in adult plumage, nor were any such seen, all being birds of the year. Specimens were taken at Igushik and Nushagak by McKay and Johnson.

Polysticta stelleri (Pall.). Steller Duck.

Evidently a common duck about Bristol Bay, but not seen by us, as we made no attempt to collect large birds. McKay and Johnson collected it as follows: Nushagak, May 20, August 14, October 8; Ugashik, July 17, November 12, November 28.

Somateria v-nigra Gray. Pacific Eider.

Eiders were found in great abundance about Bristol Bay and at Nushagak. Good-sized flocks were seen all along the Ugaguk River as well as on Becharof Lake. One specimen, a young male in transition plumage, was taken near the head of Becharof Lake October 7. Large flocks were seen at Kanatak and at Cold Bay. McKay secured specimens at Cape Constantine and Ugashik.

Somateria spectabilis (Linn.). King Eider.

Evidently quite common at Nushagak and about Bristol Bay, and doubtless seen by our party, but not recognized. McKay took several specimens at Nushagak and also at Ugashik.

Oidemia americana Swains. Scoter.

A few American scoters with broods of small young were seen on ponds a few hundred yards back from the shore of Lake Clark July 23.

Females with young were also seen occasionally along the more sluggish courses of the Chulitna River. Scoters were common at Cold Bay, and specimens of this species were killed while we were there. Numerous specimens were taken by McKay and Johnson at Nushagak, Cape Constantine, Point Etolin, and Ugashik.

Oidemia deglandi Bonap. White-winged Scoter.

A flock of 6 was seen on Neekahweena Lake, about halfway up the Chulitna River, August 14. This was the only time we met with this species. Specimens were taken by McKay and Johnson at Nushagak, Cape Constantine, and Lake Aleknagik.^a

Oidemia perspicillata (Linn.). Surf Scoter.

Surf scoters were not positively identified among the numbers of other species seen by us. Specimens were taken at Cape Constantine by McKay September 12, 1881.

Anser albifrons gambeli (Hartl.). White-fronted Goose.

Several white-fronted geese were killed on the Chulitna River in early August, and small flocks were seen frequently. One was taken on the Malchatna River, a few miles above its junction with the Tikchik, September 3. From this point down to Nushagak large flocks were seen daily, either flying noisily overhead or resting on sandy spits and islands. On the rare days or hours of sunshine they take life easily, squatting on the sand in large groups or waddling lazily and apparently aimlessly about on it.

Branta canadensis hutchinsi (Rich.). Hutchins Goose.

A flock of 10 flew over camp at the mouth of the Chulitna River August 5. The species was not seen again until we reached the Malchatna River, a few miles above its junction with the Tikchik. From this point down to Nushagak flocks were seen daily. This species seemed to outnumber the white-fronted, the only other species of goose that we saw. The two species do not mingle, but flock separately, though flocks of each were sometimes seen occupying respective areas on the same sand bar. Although there were a large number of geese in the region, we did not see such immense flocks as occur on the lower Yukon, possibly because the season was not far enough advanced. The largest flocks were of about 150 birds each. Their center of abundance seemed to be about midway between Kakwok and Nushagak.

Philacte canagica (Sevast.). Emperor Goose.

An emperor goose was collected by McKay at the mouth of the Nushagak River May 5, 1882. Two others were taken at Ugashik in

^a No. 92149, U. S. N. M., was recorded as *Melanetta fusca*, but proves to be *O. deglandi*. Cf. Ridgway, Proc. U. S. Nat. Mus., VII, p. 68, 1884.

the fall of 1881. A series of 11 specimens was also taken by McKay on Bristol Bay (exact locality not recorded) in May, 1881. Most of these have been exchanged or otherwise disposed of, and few are at present in the National Museum collection.

***Olor columbianus* (Ord).** Whistling Swan.

More or less common, and breeding in suitable places along the Chulitna River, the upper waters of the Nushagak system, and near the Ugaguk River and Becharof Lake. Several were seen flying at a distance over the marshes about the mouth of the Chulitna River August 4 to 9, and a flock of 7 was seen on Neekahweena Lake, about halfway up the Chulitna River, August 14. One was shot on Swan Lake August 18 by one of our natives. This proved to be such a desirable addition to our bill of fare that effort was made to secure others, and within the next few days two more were killed on small lakes near Swan Lake. Several small flocks were seen flying over the swampy country between Swan Lake and the mouth of the Swan River August 27 and 28. No others were noted until September 29, when a line of 8 or 10 big snowy fellows was seen slowly winging over the lake-dotted tundra near the Ugaguk River. A few days later 2 specimens were killed from a large flock on a little lake near the southwest shore of Becharof Lake, October 5.

Wild swans in their natural habitat seem infinitely more beautiful than the domestic varieties in artificial ponds. On two occasions I was favored with opportunities of seeing them under conditions seldom equaled in an ornithological experience. The first was on the evening of August 14, on the beautiful little Neekahweena Lake, after a long day of hard paddling against the current of the Chulitna River. We entered the lake just after sundown and glided slowly across, enjoying the light of a glowing sky mirrored in absolutely placid water. When we were about midway, the soft musical call note of a swan attracted attention to several small white objects on the far side of the lake. The canoe was headed toward them while the natives imitated the call. In a few minutes the objects appeared larger, and seven of the great snow-white birds were distinguished slowly approaching, calling softly and swerving in and out among themselves, half curious and half timorous. As they drew nearer, we ceased paddling and remained perfectly silent, wrapt in the spectacle, until the swans were so near that their breasts and gracefully arched necks could be seen reflected in the glassy water. This occupied but a few minutes, as they soon decided that the situation was dangerous and took flight. Until they flew, the scene, in itself extremely impressive, was made doubly so by their presence.

At another time, while seeking a vantage point for taking a photograph near Swan Lake, I ascended a slight eminence from which I

looked down through some scattered timber to a little silvery lake, twinkling through the trees, and showing here and there spots of white which I recognized as swans. After a short detour and considerable crawling from tree to tree, good cover was reached on the bank of the lake, from which I could thoroughly appreciate the beautiful sight of 10 stately swans, variously disposed, enjoying a quiet, lazy afternoon. The place was evidently much frequented, for many loose feathers were scattered along the shore and on the water, and bits of grass and water weeds were floating about. Several were young birds of the year, and though of large size were easily recognized by their juvenile manners. A flattened tussock in shallow water a few feet from the shore appeared to have been used as a nest earlier in the season.

The flesh of the swan was found excellent eating, the young birds naturally being preferable, though some of the older ones were not particularly tough. In fact, swan was voted the best meat in camp, when there was at the same time an abundance of young mallard, grouse, ptarmigan, and rabbits. The natives make various uses of the swan's skin, often taking it entire, exclusive of the wings, to make a winter garment for a small child. The skin of the foot they use for making a small bag or purse.

***Grus canadensis* (Linn.). Little Brown Crane.**

Little brown cranes were first seen September 3 on the Malchatna River, a few miles above the mouth of the Tikchik, and from that point down to the vicinity of the mouth of the Nushagak, they were very abundant. The river for this distance abounds in islands and long sand bars and spits upon which large water birds spend much of their time. When not flying the cranes are seldom seen except on these sand bars, where they mingle with the more numerous gulls and geese. On fine days they stand for hours in small groups enjoying the sun, scarcely ever making a move. Their unmistakable rattling, metallic cry usually kept one informed of their whereabouts when they were flying anywhere within half a mile. They were quite wary and rarely came within gunshot. A specimen is in the National Museum, taken by McKay, on the Nushagak River, 80 miles above its mouth.

***Crymophilus fulicarius* (Linn.). Red Phalarope.**

A single phalarope, supposed to be this species, was seen on Becharof Lake October 6. Two specimens, in full breeding plumage, were taken by McKay at Cape Constantine, Bristol Bay, May 15, 1883.

***Phalaropus lobatus* (Linn.). Northern Phalarope.**

Two northern phalaropes were taken by McKay at Igushik May 23-24, 1882, and two others at Ugashik, July 15 and August 10, respectively. Our party did not meet with the species.

Gallinago delicata (Ord). Wilson Snipe.

Several were seen in tundra swamps, near the Kakhtul River, September 1, and a half dozen individuals were seen flying while we were descending the upper Nushagak September 4. A small flock was seen on the Ugaguk River September 29. One specimen was taken at Nushagak by McKay April 25, 1882.

Macrorhamphus griseus (Gmel.). Dowitcher.

One specimen (No. 92132 U. S. N. M.) was taken near Nushagak by McKay September 24, 1882, and another (No. 101228 U. S. N. M.) at the same place by Johnson June 9, 1884. Both of these are decidedly referable to *M. griseus* and do not even equal in length of bill the smallest specimens of *M. scolopaceus* available. The culmen of No. 101228 measures 52 mm., and that of No. 92132 is 60 mm. Both are labeled male.

Arquatella couesi Ridgw. Aleutian Sandpiper.

One flock of about 20 birds was found at Cold Bay, October 16, and specimens were secured. They were found as usual huddled closely together on a slippery, spray-washed rock, apparently oblivious of everything, and showing no particular interest in life. When startled they left as one bird, and with a slight twittering flitted around the first big boulder and unconcernedly alighted in another dark, dank place. Numerous specimens were taken in April by McKay and Johnson.

Arquatella ptilocnemis (Coues). Pribilof Sandpiper.

Four typical specimens of the Pribilof sandpiper were taken by J. W. Johnson at Nushagak April 1-18, 1884.^a

Actodromas maculata (Vieill.). Pectoral Sandpiper.

One was taken by Johnson at Nushagak October 15, 1884. The species was not seen by our party.

Actodromas minutilla (Vieill.). Least Sandpiper.

One was taken on the portage between lakes Iliamna and Clark July 19. A few others were seen at Keejik, Lake Clark, July 25. After that date no more were observed. One specimen which I have not been able to find is recorded as taken by McKay on the Aleknagik River June 16, 1881.

Pelidna alpina sakhalina (Vieill.). Red-backed Sandpiper.

Several small flocks were seen flying up and down the Ugaguk River September 29. None were seen on the mud flats about Nushagak, doubtless because the water there is brackish. McKay took several specimens in May and July, 1881, at Ugashik.

^a Cf. Palmer, Birds Pribilof Ids., Fur Seals and Ids. of N. Pac., pt. 3, p. 403, Wash., 1899.

Ereunetes occidentalis Lawr. Western Sandpiper.

In the National Museum are two specimens of this sandpiper collected by C. L. McKay at Nushagak July 30 and August 10, respectively.

Limosa fedoa (Linn.) Marbled Godwit.

Two immature specimens of the marbled godwit were taken by McKay at Ugashik July 16-18, 1881. These are recorded in the National Museum catalogue as '*Limosa hudsonica*,' together with two other specimens from the vicinity of Nushagak which I have not seen.

Totanus melanoleucus (Gmel.) Greater Yellow-legs.

A male bird was taken at Iliamna Village July 14. It came sweeping in zigzag flight down into a little pond and alighted near where I was setting a trap, startling me by its sudden loud outcry. A few days later we found a pair in possession of a small pond on the portage trail between Lakes Iliamna and Clark. During a great part of each of several trips that we made back and forth, they accompanied us, making noisy and belligerent demonstrations. Time was too valuable to search for the eggs or young, which were doubtless the cause of these outbreaks. Each time when we came within about a quarter of a mile of the pond, one of the birds would be heard in a loud, high-pitched 'yip! yip!'—at least three or four cries to the second. Presently, as we came nearer, one of them would be seen flying swiftly down the trail, about 5 feet above the ground. When within about 4 or 5 feet of us, it would suddenly swoop up a few inches overhead, and with a few wide careens, would alight after considerable balancing on the tiptop of a small spruce. In a few moments the performance would be repeated with some variations and continued until we were a half mile or more from the pond. During the entire time the pitch and pace of the cries did not abate in the least, and continued long after we had passed the danger limit, and the birds were out of sight. The long-legged birds perched on the topmost twigs of spruce trees looked very much out of place. When I went over the trail last, at midnight of July 18, the yellow-legs were as much excited as ever. The grotesque appearance they made on the tops of the spruces, silhouetted against a moonlit sky, was particularly noticed.

Yellow-legs were not again found until Swan Lake was reached, where one was seen frequently, standing in a few inches of water at the edge of a riffle in a small stream and watching the water intently. Another was seen on the Malchatna River September 3. Two specimens were taken by McKay at Nushagak August 14 to 28, 1881.

Actitis macularia (Linn.). Spotted Sandpiper.

When we arrived at Lakes Iliamna and Clark, in the latter part of July, the majority of the spotted sandpipers, which doubtless breed in the

region, had migrated, and only scattering stragglers remained. One small flock of 8 or 10 hornotines was seen nervously flitting from point to point along the gravelly beaches of Lake Clark July 25. Some days later a few belated individuals were found along the lower part of the Chulitna River. Practically all were gone before August 10.

Numenius hudsonicus (Lath.). Hudsonian Curlew.

Three specimens of this curlew were taken at Nushagak by McKay in August, 1881. No species of curlew were seen by our party.

Squatarola squatarola (Linn.). Black-bellied Plover.

Two black-bellied plover were collected by McKay at Nushagak August 8 to 14, 1881.

Charadrius dominicus fulvus (Gmel.). Pacific Golden Plover.

A few small flocks were seen on the tide marshes and along the mud flats about Nushagak September 12 to 26. Several were seen at Igagik and others occasionally along the Ugaguk River, as far up as the mouth of Becharof Lake. Specimens were taken at Nushagak by McKay in June, 1881.

Ægialitis semipalmata Bonap. Semipalmated Plover.

McKay took one specimen of this species on the Nushagak River, 80 miles above Nushagak, June 25, 1881; another at Lake Aleknagik June 17, and another at Point Constantine, in Bristol Bay, May 15. It doubtless breeds commonly in the region, but was not found by us owing to our late arrival.

Aphriza virgata (Gmel.). Surf Bird.

One surf bird was taken by McKay at Nushagak August 9, 1881. The species was not seen by our party.

Arenaria interpres (Linn.). Turnstone.

One specimen was taken on the beach at Nushagak September 22, where it was frequenting the wharves and lumber piles in company with the black turnstone. One was taken by McKay at the same place August 12, 1881.

Arenaria melanocephala (Vig.). Black Turnstone.

One was taken and another seen on one of the islets near the middle of Lake Clark July 23. Turnstones were not met again until we reached Nushagak, where a flock of about half a dozen were seen daily along the beach in front of the village. Specimens were taken by McKay and Johnson at and near Nushagak and also at Ugashik in June and July.

Canachites canadensis osgoodi Bishop. Alaska Spruce Grouse.

A few small flocks were seen in the timber near Iliamna Village, July 13-15, and several scattered individuals between Lake Iliamna

and the Nogheling River. They were found in abundance all about Lake Clark, being more common there than I have ever found them elsewhere in Alaska. We seldom made a landing or walked more than 100 yards into the timber around the lake without finding one or more grouse. They feed largely on berries in the summer time, being particularly fond of those of *Vaccinium vitis-idaea*, which they eat almost exclusively from the time the little green berry first begins to swell until it is dead ripe. At this time the flesh of the birds is sweeter than in the early winter, when a diet of spruce needles has made them fatter but less palatable. In the spruce forest which is their ordinary habitat, they are unable to obtain on the moss-covered ground the grit necessary for a gallinaceous bird, so they make daily excursions to the shores of the rivers and lakes where fine gravel is to be had in abundance. Early morning before sunrise is the time for this; then they may often be seen on the beaches, singly, in pairs, or in small flocks. Doubtless they also come to the rivers to drink, though pools are common enough in the swampy openings in the timber. On the Chulitna River one was caught in a steel trap which had been set for a possible mink or weasel in the marsh grass at the water's edge.

The range of the spruce grouse is practically coextensive with that of the spruce tree. We traveled much of the time near the western limit of the timber, and found grouse fairly common, even up to the edge of the tundra, where the spruce was considerably scattered. The last one seen was a fine cock, which was startled very early on the morning of September 10, from a small beach on the Nushagak River about 25 miles above its mouth. The grouse are said to occur within a very few miles of Nushagak, however. Specimens were taken by McKay at Lake Aleknagik.

Lagopus lagopus (Linn.). Willow Ptarmigan.

Willow ptarmigan were found in nearly all the tundra and semi-tundra regions along our route. In July old females, with partly grown young, were found on Iliamna Pass and about Lake Iliamna. They were also seen along the Nogheling River. In the thick timber about Lake Clark there are of course no ptarmigan, though they may occur on some of the mountains. They were abundant along the upper Chulitna River, and particularly so on the portage to Swan Lake. There, in the latter part of August, the young were still following their parents, though they quite equaled them in size. Whether the young are restrained by their parents who fear that they are not able to care for themselves, or whether the adults reluctantly remain with the young who are too timid to expose themselves, it seems that both old and young at this time seldom attempt to escape

danger by flight. We repeatedly passed within a few feet of family parties of about a dozen birds which displayed small alarm, beyond a little craning of necks or a slight crouching, with now and then a warning cluck. Often they would not fly until almost stepped upon, and then only for a short distance. Once, while walking across the portage with a native, we came upon a small flock of ptarmigan and I witnessed a simple method of securing game without the use of shot and powder. Several of the birds were within about 20 feet, and stretched their necks to look at us from the farther side of some tundra hummocks, behind which they were standing. The native dropped on one knee, pulled out his jackknife, and without opening it tossed it lightly at one of the bobbing heads. The bird dodged the first throw and fluttered away for about 10 feet, enabling the native to recover the knife and try again. This time the knife just tapped the bird's cranium, causing it to flutter over, stunned. Before it could recover, its neck was wrung.

Willow ptarmigan were found along the Kakhtul and Malchatna whenever we went into the open tundra beyond the timber immediately bordering the rivers. Occasionally a few were flushed in the sparse timber near the edge of the tundra. Sometimes a pair or two were found on the mountain sides up to about 1,000 feet elevation, well within the domain of the rock ptarmigan. Like the grouse, the ptarmigan visit the gravel beaches along the rivers and lakes to obtain grit. A flock was seen on such a beach on the lower Nushagak River September 11. They were abundant on the tundra about Nushagak, and in the latter part of September were collected in large flocks. At one of our camps near Nushagak immense flocks came whizzing over the tent every evening just before dark, and sometimes for a short time after dark, evidently on the way to a resting place for the night. Earlier in the season, through late July and early August, we often heard the whirr of their wings at night near camp, as well as their half-croaking, half-rattling cry which seems to be an invariable and perhaps involuntary accompaniment of their flight. The food of the willow ptarmigan is much the same as that of the rock ptarmigan. Stomachs of birds taken in July contained berries of *Vaccinium* and *Empetrum*; those of a few weeks later were crammed with the aments of the dwarf birch, and those of still later date showed buds and leaves. Specimens in various plumages were taken, but our limited carrying capacity made it impossible for us to save large series. McKay and Johnson preserved large numbers from Nushagak, chiefly of birds in winter plumage, however.

Lagopus rupestris nelsoni Stejn. Nelson Ptarmigan.

A few pairs were seen on barren, rocky parts of the 'Portage Mountain,' between the head of the Chulitna River and Swan Lake,

August 19. They were unwary at this time and allowed approach within easy shotgun range. The natives recognize their distinctness from the willow ptarmigan and seem to think their differently pitched cry the most important consideration. They were again seen in the mountains on the Kanatak portage and about Cold Bay, October 12 to 26. At this time both rock and willow ptarmigans were to be found in the same flock, though in the more mountainous regions the former predominated. Although permanent snows had not yet come, the birds were rapidly losing the dark summer plumage, so that as they rested on the browned vegetation, their white bodies were very conspicuous, and could often be seen and recognized though more than a mile away on the mountain side. They had also begun their winter diet of buds, but obtained a larger variety than if snow had been on the ground.

An examination of the crops of 10 birds killed at Cold Bay showed a variety of food, but buds, particularly willow buds, predominated. Tiny buds and twigs of some small species of *Vaccinium* were found in large numbers, which must have been secured by a very tedious process. Some of the craws contained nothing but buds, others had a few leaves of *Dryas* and *Ledum*, and occasionally one contained some broken pieces of the large aments of *Alnus viridis*.

With the material at hand I have been unable to satisfactorily distinguish the rock ptarmigan of the Alaska Peninsula from those of Unalaska Island.

Lagopus leucurus Swains. White-tailed Ptarmigan.

Without being solicited, our guide, Zachar, a very intelligent native from Keejik village, described this species. He said that it was found in a few restricted localities in the mountains on the northwest side of Lake Clark.

Circus hudsonius (Linn.). Marsh Hawk.

One was seen near the mouth of the Chulitna River August 6, and others at intervals almost daily along the river. Several were seen along the Kakhtul River or beating over the swampy tundra back of it. Others were seen occasionally thence to Nushagak. Specimens from Nushagak of McKay's take are in the U. S. National Museum.

Accipiter velox (Wils.). Sharp-shinned Hawk.

A sharp-shinned hawk was seen giving battle to a pair of ravens on the Malchatna River September 3. The conflict was watched for fully fifteen minutes. During that time both sides won several apparent victories, but each time hostilities were renewed by one or the other and continued until we were out of sight. The species was not seen elsewhere. It is not contained in McKay's collection.

***Accipiter atricapillus striatulus* Ridgw.** Western Goshawk.

A goshawk was seen soaring over the mountains about Iliamna Pass July 13, and several immature birds were seen daily near camp at the mouth of the Chulitna River August 4 to 8. No others were observed until we reached Nushagak, where on two or three occasions several were seen flying over a piece of swampy tundra.

***Archibuteo lagopus sanctijohannis* (Gmel.).** Rough-legged Hawk.

A pair and two young able to fly were found in possession of an islet near the middle of Lake Clark. One of the young attempted to fly to the mainland about a mile away, but, becoming exhausted, fell into the water near the shore and was killed with a paddle. One adult was seen at the mouth of the Chulitna River August 2, and another was killed a few days later on the upper river. On the Nushagak side we saw but one. This came screaming over the boat on the lower Nushagak about September 8. One was taken on the Aleknagik or Wood River by McKay August 25, 1881.

***Aquila chrysaëtos* (Linn.).** Golden Eagle.

According to the record of the National Museum Catalogue, a golden eagle was taken by McKay at Nushagak September 30, 1882. I have looked through the collection with considerable care, but have been unable to find this specimen.

***Haliaeetus leucocephalus alascanus* Towns.** Northern Bald Eagle.

In the course of our entire trip but five eagles were seen, as follows: At Iliamna village July 15; near the head of Lake Clark July 28; at Swan Lake August 27; on the Malchatna River September 3, and on Becharof Lake October 6. The natives report them as occurring sparingly all through the region. Their primaries and rectrices are used by the natives for vanes on arrows, and a neat little pocket needle case is made from the large part of the quill by merely cutting it off and fitting a bone or wooden plug in the open end.

***Falco rusticolus gyrfalco* (Linn.).** Gyrfalcon.

Several falcons, presumably this species, were seen flying about a high volcanic cliff on Becharof Lake October 4. An unsuccessful shot sent them screaming away and they were not seen again. Specimens were taken at Nushagak and at Ugashik by McKay.

***Falco columbarius* Linn.** Pigeon Hawk.

One was taken and another seen on the Nogheling River about half-way between Lakes Iliamna and Clark July 19. Several were seen flying over or unsteadily balancing on the topmost twig of some tall spruce along the Chulitna River. A second specimen was taken at the forks of the upper river August 17. The species was also seen

occasionally along the Kakhtul and Nushagak rivers. Specimens were secured at Nushagak and Aleknagik Lake by McKay.

***Pandion haliaëtus carolinensis* (Gmel.). Osprey.**

Ospreys were found quite commonly on nearly all the river courses we traversed. Fish are plentiful throughout the region, and the birds doubtless find an easy living. The first was seen soaring over the Nogheling River July 21. The next day a nest was seen in the top of a spruce on the bank of the same stream. Ospreys were seen at intervals along the Chulitna River and nearly always in the vicinity of their nests, which are bulky, flat-topped affairs, invariably located on the very top of a live spruce near the river bank, thus being very conspicuous. In several places along the Chulitna the young ospreys were seen perched on the edge of the nest. A few ospreys were seen along the Kakhtul River. One pair had a nest about half a mile from one of our camps on the Kakhtul. The old birds made one or two trips over us every day, maneuvering about in the air above the tent, dangling their legs characteristically and crying loudly or whistling shrilly.

***Asio accipitrinus* (Pall.). Short-eared Owl.**

The short-eared owl, as well as most other species of the coast region, was met some 25 miles above Nushagak, and was seen in considerable numbers. It was attracted by the light in the tent at night and came about several of our camps near the mouth of the Nushagak River and on Becharof Lake. Several were seen flying over the houses at twilight in the villages of Nushagak and Igagik. Numerous specimens were taken by McKay and Johnson at and near Nushagak and at Ugashik.

***Cryptoglaux tengmalmi richardsoni* (Bonap.). Richardson Owl.**

The catalogue of the National Museum records one specimen of Richardson owl, taken at Nushagak by J. W. Johnson February 20, 1884. I have been unable to find this specimen in the Museum, but since the occurrence of the species in the region is altogether probable, and since most of the names entered in the catalogue are correct, the record may be accepted.

***Bubo virginianus algistus* (Oberh.). Great Horned Owl.**

Horned owls are only fairly common in the region traversed. One was heard at Iliamna village July 14, another at the mouth of the Chulitna River August 6, and a third on the lower Kakhtul River September 1. A specimen in immature plumage was taken at the forks of the upper Chulitna River August 16. While this specimen was being prepared, our native guide asked that the body be saved for him. When it was delivered to him it promptly went into the pot, and shortly after 'boiled owl' was eaten with a relish by the natives.

On being questioned about it they replied: "Eat um? Yes; eat um. Good! All same glouse." A specimen of this owl was taken by McKay near Aleknagik River August 24, 1881.

Nyctea nyctea (Linn.). Snowy Owl.

A poorly mounted snowy owl was seen in the trader's store at Nushagak. The species is said to be a regular winter visitant there, as well as at Igagik and Becharof Lake. Specimens were taken on the Malchatna River and at Lake Aleknagik by McKay.

Surnia ulula caparoch (Müll.). Hawk Owl.

An immature bird was taken in some thick woods near the head of Lake Clark July 27. One was seen giving battle to a pair of ravens at the mouth of the Chulitna River August 8. It was shot later from the top of a tall spruce, where it was resting after its exertions. A third was killed a few miles up the river on the following day. One was taken by McKay on the Aleknagik or Wood River, October 20, 1881, and four were taken by Johnson at Nushagak in November and December, 1884.

Ceryle alcyon (Linn.). Belted Kingfisher.

One was seen on the Kakhtul River August 28; another near the same place August 31, and a third flew cackling by us down the Malchatna River September 3. These were the only kingfishers observed on the entire trip.

Picoides arcticus (Swains.). Arctic Three-toed Woodpecker.

An adult male was taken on the Malchatna River by McKay, in March, 1883. It is the only specimen of this species from Alaska in the U. S. National Museum, and, as far as I can learn, there is no other record of its occurrence in the Territory.^a During three seasons' work in various parts of Alaska I have never seen this woodpecker nor heard any report of it.

Picoides americanus fasciatus Baird. Alaska Three-toed Woodpecker.

A woodpecker was heard near Iliamna Village July 15; another near Keejik Village, on Lake Clark, July 24, and two specimens were taken near the head of Lake Clark July 29. Another was heard on the Chulitna River early in August, and this ended our experience with woodpeckers. Though conditions are everywhere favorable for them in this region, they seem to be quite rare. One specimen was taken by McKay on the Nushagak River January 10, 1882.

Sayornis saya (Bonap.). Say Phoebe.

One specimen, probably a migrant, was taken at the mouth of the Chulitna River August 6; no others were seen.

^aNelson records one specimen from Fort Reliance, which is not in Alaska but in Yukon Territory. Cf. Nat. Hist. Coll. in Alaska, p. 157, 1887.

Otocoris alpestris arcticola Oberh. Alaska Horned Lark.

A small flock of 10 or 15 was seen flying about the summit of the 'Portage Mountain,' between the head of the Chulitna River and Swan Lake, August 19. No specimens were secured there, and the species was unfortunately not seen elsewhere.

Pica pica hudsonia (Sab.). Magpie.

A magpie was brought in by a native boy at Keejik Village, on Lake Clark, July 26, and several others were seen in the mountains near the head of the lake July 28. Magpies were not found again until Becharof Lake was reached, where one was taken October 6. A small flock was seen at Kanatak October 12. One was taken by McKay on the Malchatna River December 25, 1881, and four others on the Nushagak River December 13-27, 1881. They doubtless occur sparingly throughout the entire region.

Perisoreus canadensis fumifrons Ridgw. Alaska Jay.

As soon as we reached the timber on the interior side of Iliamna Pass, we met the jays, and from that time until we reached Nushagak we saw a good deal of them. They were perhaps most common about Lake Clark, but were frequently seen along the Chulitna River and on the divide, and thence to Nushagak. They frequently came about our camps, but never attempted any great familiarity. Sometimes they picked up scraps of meat near the tent, but were usually very cautious about it, at least while we were in the vicinity. They generally preferred to sit a few rods away in a spruce and entertain us by practicing some of their vocal accomplishments, which are not a few, and well warrant their being given the title of 'Mockingbird of the North.' Specimens were taken at Iliamna Village, at Lake Clark, and on the Kakhtul River. They were also taken in small numbers at Nushagak by McKay and Johnson.

Corvus corax principalis Ridgw. Northern Raven.

A small party of ravens were about camp at the mouth of the Chulitna River and kept it well cleaned of bits of meat and refuse. The raven's ability to appear from space and discover a cubic inch of decaying meat in a secret place seems second only to that of the bluebottle fly and the turkey buzzard. The birds were among the first to be active in the morning, and many times awakened us when it was scarcely dawn by the peculiar whizzing sound made by their wings as they flew slowly back and forth over the tent. Ravens were more or less common all along the route. Several were seen along the Nogheling River July 21; scattering pairs and small flocks were seen or heard at various points about Lake Clark; others now and then attracted our attention as we went down the Kakhtul and the Nushagak. They were common at Nushagak and at Igagik. Large flocks

were seen at Kanatak, doubtless attracted by the carcass of a right whale which had drifted ashore near there. A few were seen at Cold Bay.

Nucifraga columbiana (Wils.). Clarke Nutcracker.

A fine specimen of the Clarke nutcracker was taken by J. W. Johnson at Nushagak November 5, 1885. This, I believe, is the second specimen of this species known to have been taken in northern Alaska.^a

Euphagus carolinus (Müll.). Rusty Blackbird.

One specimen was taken in a willow thicket near Keejik Village, Lake Clark, July 24; no others were seen in this vicinity. They were next found along a small creek near the headwaters of the Chulitna River, where they were quite common for a few miles. Several were seen about the deserted huts of the native village of Ikwok, on the Nushagak River, September 5. McKay took one specimen on the Nushagak River and two at Lake Aleknagik.

Pinicola enucleator alascensis Ridgw. Alaska Pine Grosbeak.

Pine grosbeaks were collected by McKay near Nushagak, near Lake Aleknagik, and on the Nushagak River. Among these was the type of *P. e. alascensis* (No. 86510, U.S.N.M.), taken June 9, 1881, in spruce woods 6 miles above Nushagak. No pine grosbeaks were seen by our party.

Loxia leucoptera Gmel. White-winged Crossbill.

Crossbills were seen in much less numbers than I have usually found them elsewhere in Alaska. A few small flocks were seen at a distance about Lakes Iliamna and Clark, but they were not noted elsewhere. A single adult female was taken in January, 1883, on the Malchatna River, by McKay.

Leucosticte tephrocotis griseonucha (Brandt). Aleutian Leucosticte.

One adult male, doubtless a straggler from the Alaska Peninsula, was taken at Nushagak by McKay, November 1, 1882. It is intermediate in size between *L. griseonucha* and *L. littoralis*, being similar to some specimens from Kodiak Island.

Acanthis hornemanni exilipes (Coues). Hoary Redpoll.

Flocks were seen in September at Nushagak and along the lower Nushagak River; also found commonly about Becharof Lake and at Kanatak and Cold Bay, October 1-26. Several specimens were taken on Becharof Lake and at Cold Bay. June and July specimens in breeding plumage, taken at Nushagak by McKay and Johnson, are in the National Museum, and afford a good example of the residence of arctic birds at this point.

^a Cf. Ridgway, Man. N. Am. Birds, p. 364, 1887; Grinnell, Birds Kotzebue Sound, Pac. Coast Avifauna No. 1, p. 77, 1900.

In the fall, after most of the other small birds are gone, the little redpolls are more conspicuous, and many a long tramp in a dreary region is relieved of some of its monotony by their cheerful appearance at frequent intervals. They are intensely gregarious, seeming to have no individuality whatever. One even recalls their notes collectively as a medley of clicking and chipping, not musical but agreeable nevertheless. After the alders have shed their leaves the redpolls frequent them a great deal. They alight in small clouds in these thickets, swerving suddenly from their course as if one and all had suddenly changed their minds, or as if shying from a fancied danger, and in a flash they disappear in the bushes and immediately begin feeding in matter-of-fact fashion on the pendent aments. When startled they fly out hurriedly in all directions, chipping excitedly. When flying high they undulate and utter a 'cheep' much after the manner of siskins and goldfinches.

***Acanthis linaria* (Linn.).** Redpoll.

Redpolls were common in the timbered regions about lakes Iliamna and Clark and along the Chulitna River. One was taken at Iliamna Village, July 13, and another on Lake Clark, July 23, both of which were adult males referable to typical *linaria*. Among a number of redpolls taken at Nushagak by McKay and Johnson is one (No. 86526 U.S.N.M.) which seems also to be true *linaria*. It was collected June 21, 1881, and is in very much abraded plumage.

***Acanthis linaria holbœlli* (Brehm).** Holbœll Redpoll.

Taken at Nushagak by McKay and Johnson. Four June and July birds which have been examined are quite characteristic of this form. It was not recognized among the numbers of *A. wilipes*, seen by us at Nushagak in September. Nushagak is perhaps near the southern limit of its breeding range.

***Spinus pinus* (Wils.).** Pine Siskin.

One was taken at Iliamna Village, July 13, and a few others seen. Several were seen on the Nogheling River, July 21. They were not seen later, and no specimens are mentioned as taken by McKay at Nushagak.

***Passerina nivalis* (Linn.).** Snowflake.

One specimen was taken on the beach at Nushagak, September 20, and another was seen in company with it. A small flock was seen on Becharof Lake, October 6, and a few more were seen in the mountains between Becharof Lake and Kanatak. Numerous specimens were taken at Nushagak by McKay and Johnson. Most of these are winter birds, but at least one (No. 110128) is in full nuptial plumage. It was taken July 3, 1886, which would indicate its breeding in the vicinity.

It also breeds at Cold Bay, where Maddren found it nesting in high rocky cliffs in the summer of 1903.

***Passerina hyperborea* (Ridgw.).** Hyperborean Snowflake.

The bird used as the basis for the original description of the female in winter plumage of this species was taken by McKay at Nushagak, November 16, 1882. A male bird was taken by him at the same locality, December 10, 1882. The species is evidently a regular winter visitant to this locality, for Johnson took two specimens November 12, 1884, and March 13, 1885, respectively.

***Calcarius lapponicus alascensis* Ridgw.** Alaska Longspur.

Longspurs were first found in numbers in the coast region on the lower Nushagak River, though a few high-flying birds supposed to be this species were seen in the mountains along the Kakhtul River, September 3. They were practically the only small land birds to be found in the tundra about Bristol Bay during middle and later September. They were not in large flocks, but in parties of 10 to 20, or very frequently in twos and threes. When flushed, they usually rose up against the strong wind that was blowing most of the time and swung around with it, and in a few long sweeps alighted within a short distance. When the vegetation is dead and browned in the fall, their changed plumage makes them very inconspicuous birds. They were seen daily at Nushagak, at Igagik, along the Ugaguk River, and at various points along Becharof Lake. A few were seen at Kanatak and several at Cold Bay as late as October 25. Numerous specimens were taken at Nushagak by McKay and Johnson.

***Passerculus sandwichensis alaudinus* (Bonap.).** Western Savanna Sparrow.

Breeding abundantly on the treeless slopes and in the small grassy mountain valleys on the west side of Iliamna Pass, where one specimen was taken July 12. Seen in small numbers in open places in the vicinity of Iliamna Village and along the Noghelung River. None were seen about Lake Clark until August 7, when they suddenly appeared in considerable numbers near the mouth of the Chulitna River, not in the open swamps, but in scattering twos and threes in the thick willow brush, evidently preparing for migration. After this date none were seen. McKay and Johnson found the species breeding at Nushagak.

***Zonotrichia leucophrys gambeli* (Nutt.).** Intermediate Sparrow.

First seen on the portage between Lakes Iliamna and Clark, where it was found in company with *Z. coronata* July 18. Scattered individuals were observed later about Lake Clark and along the Chulitna River. One specimen was taken and a few others were seen near

Swan River August 27. They were quite rare at this time, and the majority that breed in the region had doubtless migrated. One specimen was taken at Nushagak as late as September 18. Specimens were also taken at this locality by McKay, June 6 to August 9, 1881.

***Zonotrichia coronata* (Pall.).** Golden-crowned Sparrow.

The golden-crowned sparrow was the first land bird seen when we reached Iliamna Bay. It was very common in the low brush on the steep mountain sides about the bay, where M. W. Gorman found several nests in the latter part of June. These, he says, usually contained four eggs, though one with six was found. The bird was abundant at Iliamna village and between there and the bay. Large streaked young were found on Lake Iliamna July 17, and a few were seen about Lake Clark, which is probably as far as the species ranges into the interior. The birds are rather erratic about going south in the fall and do not all leave at once, as straggling individuals remain until quite late. One of these stragglers was taken by Johnson at Nushagak as late as November 5. Breeding birds were also taken there by McKay in June.

***Spizella monticola ochracea* Brewst.** Western Tree Sparrow.

Several were seen on Iliamna Lake July 16 near the Nogheling portage, where one specimen was taken. A few were seen about Lake Clark, and a specimen was taken at the mouth of the Chulitna River August 3. On the trip up the Chulitna, tree sparrows were found to be quite common, being the characteristic birds of the low brush and almost the only small birds that were regularly seen each day. They were also common about the Chulitna portage and from there on down the Swan River and the Kakhtul to the Malchatna, after which they were seen no more. McKay secured specimens at Nushagak and on the Nushagak River 80 miles above its mouth.

***Junco hyemalis* (Linn.).** Slate-colored Junco.

Up to the second week in August juncos were seen almost daily from Iliamna village to the lower Chulitna River. They were in scattered family parties, the older members of which took particular pains to follow us through the woods whenever occasion offered, persistently scolding and flitting excitedly about, making more disturbance than many other birds would at the invasion of their nests. Like the chickadees, they were particularly responsive to 'squeaks,' and seldom failed to appear promptly when calls were given for more desirable species. Several specimens were taken. They were not taken at Nushagak by McKay and Johnson. Perhaps they do not occur farther west than the Iliamna region, though it would be strange if they did not range throughout the spruce timber.

***Passerella iliaca* (Merrem). Fox Sparrow.**

A specimen of typical *Passerella iliaca* (No. 86535 U. S. N. M.) in breeding plumage was taken by McKay at Nushagak June 6, 1881. From this it would seem that the species breeds all along the coast of Bering Sea, north of the Alaska Peninsula, since it is known to be a common breeder at St. Michael. A specimen (No. 110105) collected by J. W. Johnson at an unknown locality on the Alaska Peninsula is intermediate in character between *iliaca* and *unalaschensis*, but nearer to *iliaca*.

***Passerella unalaschensis* (Gmel.). Peninsula Sparrow.**

One specimen was taken and several were seen in the mountains near Iliamna Bay July 12; two others, one adult and one immature bird, were taken at Iliamna village July 14; and another young bird was taken on Lake Iliamna at the Noghelung portage July 18. These agree well with birds from the Shumagin Islands and localities to the westward on the Alaska Peninsula. Doubtless these localities are near the eastern limit of the range of typical *unalaschensis*, since aberrant birds are found in Cook Inlet.^a The young are easily distinguishable from young of *insularis* and *annectens* by much the same characters as the adults. They are generally grayer and less rufescent and the light-creamy areas on the under parts are more extensive. On the upper-parts the head, neck, and forepart of the back are grayer, and show greater contrast with the rump and upper tail-coverts.

A specimen of typical *unalaschensis* in fresh fall plumage was taken at Nushagak September 19; another, which is not quite typical, but easily referable to *unalaschensis*, was taken at the same locality by J. W. Johnson October 22, 1884. These birds may have been wanderers, but if so they must have wandered out of their regular course of migration and traveled in a northerly or westerly direction for a considerable distance, as their known breeding range is to the south and east. Nushagak, where typical *iliaca* breeds, is scarcely 100 miles from Lake Iliamna and points on the Alaska Peninsula where we have typical *unalaschensis*. Between these localities there is no physical barrier and no appreciable difference in temperature or environment. If we assume that intergradation takes place between these two birds in this short distance, we must do it merely on the evidence of a very limited number of specimens showing a combination of characters. Without apparent environmental cause it hardly seems possible that differentiation takes place in such a short distance between two such well-marked forms; one a distinctly rufescent bird, the other as distinctly olivaceous gray; one with bright chestnut primaries and rectrices, the other with these parts of quite different color; one a bird with white wing-bars, the other with none; one with

^aCf. N. Am. Fauna No. 21, p. 79, 1901.

back striped, the other with back plain. If it be true that gradual intergradation according to a sequence of geographical units does take place in this case, it is certainly the most remarkable on record. If we consider the few intermediate specimens as hybrids pure and simple, there is much less to be explained. Additional specimens from different parts of the Alaska Peninsula would perhaps decide the question, but while it is necessary to choose from hypotheses, I prefer the hybrid theory to that of gradual geographic intergradation. In this connection it is interesting to note that most of the supposed 'intergrades' are winter birds from California and that no typical *iliaca* has been taken in California.^a Accepting the hybrid theory, it is possible to believe that these birds were led to take a western route, while typical *iliaca*, although breeding in practically the same region, has invariably followed its own route to the eastward.

Hirundo erythrogastra Bodd. Barn Swallow.

Barn swallows breed commonly in the vicinity of Lake Iliamna and Lake Clark, where we found them in late July and early August. It is probable that they are also summer residents of much of the other country through which we traveled, but we arrived too late to find them. They were seen in small numbers at Iliamna Village July 14; on Lake Iliamna July 15; about the islands in Lake Clark July 23; and near the mouth of the Chulitna River August 6 to 10. They appeared with other swallows in considerable numbers August 6, and soared about all day. The majority of them disappeared the next day (August 7), and by August 10 practically all were gone.

Iridoprocne bicolor (Vieill.). Tree Swallow.

A few unmistakable tree swallows were seen in company with flocks of violet-green swallows at Iliamna Village July 13 to 15. They were not recognized with certainty elsewhere.

Tachycineta thalassina lepida (Mearns). Northern Violet-green Swallow.

Violet-green swallows were found in considerable numbers at Iliamna Village and several specimens were taken July 13 to 15. At this time they were flying actively as late in the evening as 9.30. Earlier in the season they doubtless fly much later. Small numbers were seen on Lakes Iliamna and Clark. On August 6 they were preparing to migrate. None were seen after August 10, when I left the mouth of the Chulitna River.

Riparia riparia (Linn.). Bank Swallow.

No signs of bank swallows were seen except along a short stretch of the Nushagak River between the mouth of the Tikchik and Kakwok, where most of the high banks were drilled along the upper edges with

^aI believe I am correct in this. *P. iliaca* has been variously recorded from California, but so far as I know the specimens are of the hybrid type.

their characteristic holes. The birds themselves were not seen, doubtless having migrated early in August. Summer specimens taken at Nushagak by McKay are in the National Museum.

Lanius borealis Vieill. Northern Shrike.

An immature bird was taken at the mouth of the Chulitna River August 5, and another at Swan Lake August 25. One was seen on the Kakhtul River August 31. Another, the last one seen, was found near Nushagak September 17. Two specimens were taken by McKay at Ugashik September 20, 1881.

Helminthophila celata (Say). Orange-crowned Warbler.

A few scattering birds were seen in the low bushes about Lakes Iliamna and Clark in July. One specimen was taken at Iliamna Village July 14, and another, an immature bird, near the head of Lake Clark July 26. The species doubtless went south with the other warblers soon after the 1st of August, as we saw none after that date. The immature example differs quite decidedly from the adult, in having two buffy wing bars, buffy sides, grayish head and throat, a decided whitish loreal stripe, and a grayish brown pileum and nape distinct from olivaceous back. The species breeds in the vicinity of Nushagak, as testified by several specimens taken in June by McKay.

Dendroica æstiva rubiginosa (Pall.). Alaska Yellow Warbler.

The yellow warbler was one of the least common of the warblers seen about Lake Iliamna and Lake Clark during the early part of our trip. One specimen was taken at Iliamna Village July 15, and another about 10 miles above the mouth of the Chulitna River August 11. Several others were seen or heard near Iliamna Village and about Lake Clark. Specimens were taken at Nushagak by McKay and Johnson.

Dendroica coronata (Linn.). Myrtle Warbler.

The myrtle warbler was found in considerable numbers about Lake Clark, where it doubtless breeds. It was most abundant August 6, when a slight migrating wave was observed at the mouth of the Chulitna River. Several specimens were taken, including both adults and young of the year. The species was collected at Nushagak by McKay.

Dendroica striata (Forster). Black-poll Warbler.

This was the most common of the warblers seen from July 14 to August 12. It was fairly common at Iliamna Village; a few were seen along the Nogheling River, and many at various points along Lake Clark. They frequented the tops of the deciduous trees more than the other warblers, which generally kept lower down in the willow brush. Our camp at the mouth of the Chulitna River was situated in a grove of birch and poplar. From August 6 to August 10 it was

possible to step outside the tent at almost any time during the day and see one or more black-polls flitting through the tree-tops. Of the seven specimens taken nearly all are young in transition plumage. One taken on Lake Clark July 23 is irregularly patched with parts of the juvenal and the first fall plumages. The light olivaceous of the new plumage is appearing strongly on the pileum, breast, and sides, and a few new feathers are scattered through the scapular tracts. Elsewhere is the more or less mottled dusky and creamy of the juvenal plumage. The species undoubtedly breeds throughout the timbered region traversed by us. McKay's collection contains two breeding birds, one taken on the Nushagak River, 80 miles above its mouth, June 25, 1881, and one at Aleknagik Lake June 17, 1881.

Seiurus noveboracensis notabilis Ridgw. Grinnell Water Thrush.

A pair of water thrushes was seen at Iliamna Village July 14. They flew nervously about in a willow thicket, and acted as if a brood of young might be secreted in the vicinity. No more were seen until August 3, when they became quite common at the mouth of the Chulitna River, where they were beginning to migrate. Their quick, nervous actions and decisive call note made them very noticeable. Three specimens were taken there, one of them being caught in a mouse trap under a decayed log in a boggy place. None were seen later than August 7. One specimen was taken by McKay on the Nushagak River, 85 miles above its mouth, June 6, 1881.

Wilsonia pusilla pileolata (Pallas). Pileolated Warbler.

Pileolated warblers were found in abundance among the thickets of alder and willow from the summit of Iliamna Pass to Iliamna Village. They were found about Lake Clark and were particularly numerous among other migrating warblers at the mouth of the Chulitna River August 5 to 7, perhaps being second in abundance only to the blackpoll warbler. They were found in low brush, particularly willow, rather than higher up in birches and spruce, where other species preferred to be. Specimens were taken at Iliamna Pass, Iliamna Village, head of Lake Clark, and at the mouth of the Chulitna River. In 1881 McKay took four specimens at Nushagak.

Budytes flavus alascensis Ridgw. Alaska Yellow Wagtail.

McKay and Johnson secured four breeding birds of this species in June and July at Nushagak. This is doubtless near the southern limit of its breeding range on this continent.

Anthus pensilvanicus (Lath.). Pipit.

A few small flocks were seen in barren rocky places about the tops of some low mountains near the Kakhtul River August 29-31. McKay secured two specimens at Nushagak August 25, 1881.

Cinclus mexicanus Swains. Dipper.

One adult was taken at the mouth of a cold rushing stream near the head of Lake Clark August 1. It was accompanied by a young bird, able to fly but not lacking in juvenile manners. The parent skipped about the rocks or dove unconcernedly into the icy riffles. Meanwhile the young one, with feathers ruffled and head thrown slightly back, fluttered about, making frequent stops, while it kept up a plaintive cry, accompanied by a fretful expression about all its movements which reminded me of a wilful child. These were the only ouzels met with until near the end of our trip, when a specimen was taken on a small mountain stream at Cold Bay October 18. McKay took five specimens on the Malchatna River December 15-20, 1881.

Parus atricapillus turneri Ridgw. Turner Chickadee.

Chickadees were found sparingly all along our route. Toward the end of the season they shared places in our affections with the redpolls, as most of the other small land birds had migrated. Specimens were taken on Lake Clark, on the Nushagak River, at Nushagak, and at Cold Bay. Specimens from Nushagak, taken by McKay and Johnson, are also in the National Museum. These, as well as others from Alaska, seem to indicate that *Parus atricapillus turneri* merits recognition as a form subspecifically different from *P. a. septentrionalis*. The Alaska bird contrasted with *P. a. septentrionalis* is characterized by a decidedly smaller and more slender bill, shorter wing and tail, and general grayer coloration. The black of the pileum is more dead bluish-black, without any brownish cast as in *septentrionalis*; the white on the outer webs of the secondaries is broader and more extensive; and on the outer web of the outer rectrix there is less tendency to a dusky wedge next to the shaft. In fall plumage particularly there is less buffy tingeing on the back and rump, as well as on the sides, than is the case with *septentrionalis*.

Parus hudsonicus Forst. Hudsonian Chickadee.

The Hudsonian chickadee was much less common than I have usually found it elsewhere in Alaska. Only two specimens were collected, one at the head of Lake Clark, July 31, and another at Nushagak, September 19. A few small flocks were seen at other points, but at rather long intervals.

Acanthopneuste borealis (Blas.). Kennicott Willow Warbler.

Two specimens of this interesting bird were secured near Iliamna Village, July 13 and 14. They were found in small deciduous trees, where their actions were not noticeably different from those of other warblers with which they were associated. McKay's collection contains one specimen of this species taken near the Aleknagik River, August 24, 1881. Two specimens taken by J. W. Johnson, at Nushagak, June 19, 1884, are in the National Museum. Previous records

include 9 specimens from Alaska—6 from Norton Sound,^a 2 from the Kowak River,^b and 1 from Port Clarence.^c

***Hylocichla aliciae* (Baird).** Gray-cheeked Thrush.

A gray-cheeked thrush was seen at Swan Lake August 25, and another a few days later on the Kakhtul River; a third was collected near the mouth of the Kakhtul River September 1. This specimen is more olivaceous than any other I have seen, which is perhaps due to its being in newly acquired fall plumage. McKay secured two specimens, one at Aleknagik Lake and one near Nushagak.

***Hylocichla ustulata swainsoni* (Cab.).** Olive-backed Thrush.

This thrush was heard rarely in late July in the Lake Iliamna and Lake Clark region, and not at all after we left the mouth of the Chulitna River early in August. The lateness of our arrival doubtless deprived us of the pleasure of hearing the beautiful night song of the bird, so well known to summer travelers in Alaska. One specimen was taken on Lake Clark, near Keejik, July 24.

***Hylocichla guttata* (Pall.).** Alaska Hermit Thrush.

Two specimens taken at the head of Lake Clark July 29 were the only hermit thrushes seen. Two specimens taken at Nushagak by McKay and Johnson are recorded in the National Museum Catalogue, but I have been unable to find them.

***Merula migratoria* (Linn.).** Robin.

A few robins were seen near Iliamna Village, and one specimen was taken there July 15. From this point on to the upper Chulitna River robins were seldom seen, though once in a great while we heard their familiar note. They were quite abundant in small flocks about Swan Lake August 25, and considerable numbers were also seen near there in the brush and young timber around the base of the 'Portage Mountain.' Specimens were taken at Nushagak by McKay in June, 1881.

***Ixoreus naevius* (Gmelin).** Varied Thrush.

The unmistakable note of this species was heard on the Kakhtul River on the evening of August 28, and the following day, a few miles farther downstream, one of the birds was seen perched in the top of a spruce. The species was not observed elsewhere. McKay secured specimens in June on the Nushagak River near its mouth, and at Aleknagik Lake.

^a Dall and Bannister, Trans. Chicago Acad. Sci., I, p. 278, 1869; Baird, Ibid., p. 313; Nelson, Nat. Hist. Coll. in Alaska, pp. 214-215, 1888; McGregor, Condor, IV, p. 144, 1902.

^b Townsend, Auk, IV, p. 13, 1887, and Cruise of Rev. Stmr. *Corwin* in 1885, p. 94, 1887; Grinnell, Birds of Kotzebue Sd., Pac. Coast Avifauna No. 1, p. 60, Nov., 1901,

^c Townsend, Auk, loc. cit.

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